BANG & OLUFSEN A/S
DK - 7600 STRUER
DENMARK

TELEPHONE 07 - 85 11 22* · TELEX 66529
CABLE ADRESS BANGOLUF

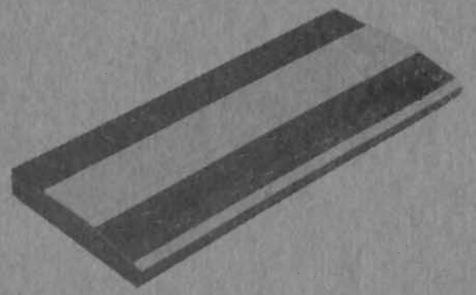
3538347

d. kr. 14.00

PRINTED IN DENMARK 2-77

Bang & Olufsen

RYLAND HUNTLEY & Co.
15 OLD BOND ST.
BATH
Telephone 4332
AUDIO EQUIPMENT SPECIALISTS



BEOMASTER 2400

TYPE 2901

SERVICE MANUAL

CONTENTS

	SECTION
Technical data	1
Disassembly/assembly	2
Functional description	3
Adjustments	4
Electrical parts list	5
Parts list	6
Diagrammes, PC-boards, TR - IC and diode list	7
Modifications	8

INTRODUCTION

Beomaster 2400, type 2901 is developed on the basis of Beomaster 1900, type 2903. The receiver has ultrasonic remote control of programme selection and volume control as a supplement to the built-in touch panels.
FM receiver, AF section, and circuits in connection with the touch panels on the receiver correspond to Beomaster 1900 and we therefore refer to the description of these circuits in the service manual previously forwarded.
The electrical parts list for the AF section deals with the components of left channel, only. This has been taken into consideration at the numbering of the diagramme. The last two digits are identical. Left channel begins with 200, right channel with 300.
Besides a number each component is provided with a co-ordinate designation, e. g. B3. This designation refers to the position of the component on the PC board which is divided into squares.
In this service manual all drawings of the component placing are shown from the copperfoil side.

TECHNICAL DATA

AMPLIFIER

Power output 1000 Hz RMS	2 x 30 W/4 Ohms
	2 x 20 W/8 Ohms
Music power	2 x 50 W/4 Ohms
	2 x 30 W/8 Ohms
Speaker impedance	4 Ohms
Harmonic distortion	
1000 Hz, 50 mW	<0,07 %
DIN 45 500, 40 – 12,500 Hz	<0.13 %
Intermodulation DIN 45 500	<0.15 %
Frequency range ± 1.5 dB DIN 45 500	20 - 40.000 Hz
Power bandwidth, 1 % distortion	10 - 40.000 Hz
Damping factor	>70
Input pick-up	3 mV/47 KOhms
Input tape	220 mV/470 KOhms
Signal-to-noise ratio DIN 45 500	
50 mW, pick-up	>60 dB
50 mW, tape recorder	>65 dB
Channel separation 1000 Hz, DIN 45 500	>56 dB
250 – 10.000 Hz	>38 dB
Output, tape recorder 1000 Hz, DIN 45 500	100 mV/100 KOhms
Headphones	Máx. 6 V/200 Ohms
Bass control at 40 Hz	± 18 dB
Treble control at 12.500 Hz	± 15 dB

FM

FM range	87.5 – 108 MHz
Sensitivity, stereo 46 dB	<30 µV/75 Ohms
Signal-to-noise ratio, stereo, weighted	>60 dB
Frequency range DIN 45 500, ± 1,5 dB	20 - 15.000 Hz
Harmonic distortion DIN 45 500	<0,4 %
Stereo channel separation 1000 Hz	>35 dB
Pilot suppression 19 kHz	>45 dB
38 kHz	>50 dB

OTHER DATA

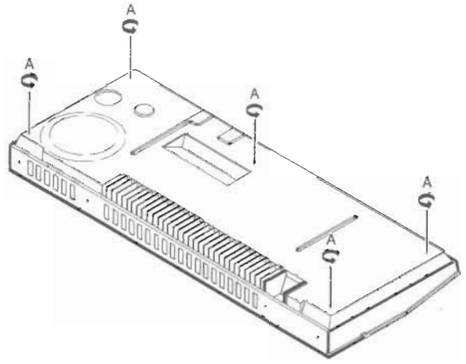
Power supply	110 - 130 - 220 - 240 V
Power consumption	25 – 185 W
Dimensions W x H x D	52 x 6 x 25 cm
Weight	7,6 kg

Subject to change without notice.

HIGHER O/P. at Tape SKT
TOP Fit Panel. 8002335
after Removing 2R223, 224, 225
& C214. & 2R323, 324, 325, C314.
Connect Supply lead to
15V. Rail

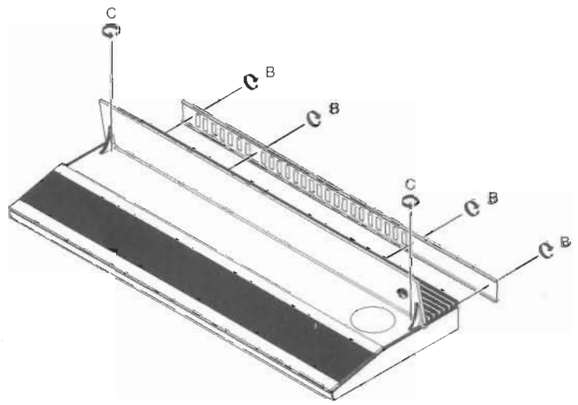
DISASSEMBLY/ASSEMBLY

BOTTOM PLATE



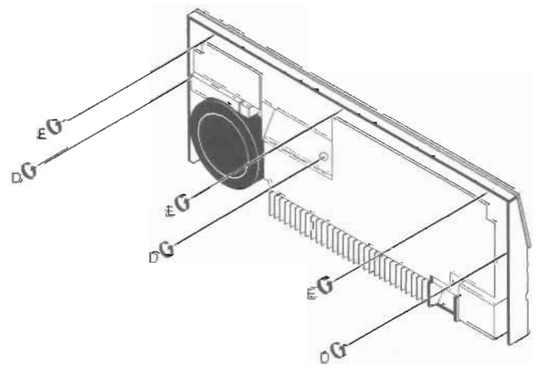
Dismount the 5 screws (A). Raise the front edge of the bottom plate.
When assembling take care that the rear edge of the bottom plate is mounted under the edge of the back plate..

TOP PANEL WITH COVER



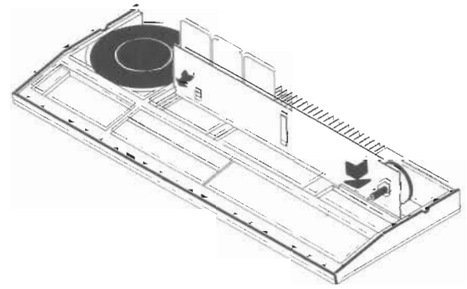
Dismount the 4 screws (B). Remove the back plate. Dismount the 2 screws (C). Raise the rear edge of the top panel.
When assembling check that all buttons are mounted and that tone control slides are in touch with slide potentiometers.

OPERATING PANEL



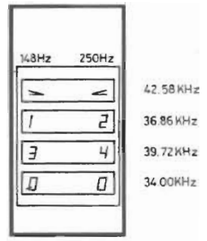
Dismount screws (D and E) (6 pcs.). Now it is possible to remove the operating panel. TAKE CARE NOT TO DAMAGE THE CONTACT SPRINGS.
When assembling check that all contact springs are in connection with the pins of the PC board.

SERVICE TIPS



When servicing PC board 4 may be placed in the two grooves, as shown in the sketch.

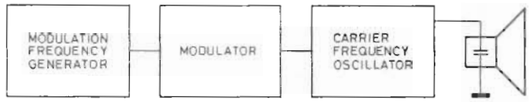
FUNCTIONAL DESCRIPTION



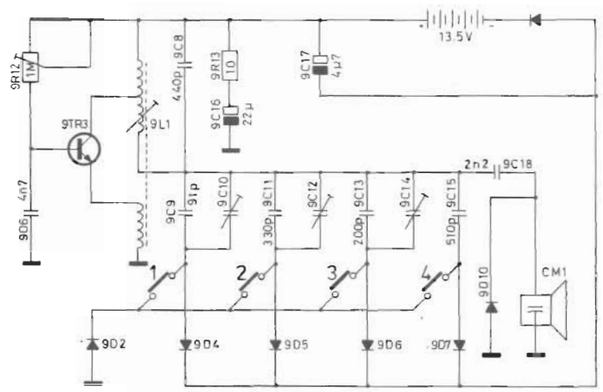
TRANSMITTER

The ultrasound transmitter for the Beomaster 2400 employs an AM-modulated carrier frequency.
The carrier frequency oscillator can be tuned to 34.00 kHz, 36.86 kHz, 39.72 kHz or 42.58 kHz, depending on which button is operated.
The modulation frequency generator is tunable to 148 Hz and 250 Hz.
The carrier frequencies are the same as those used in the Beomaster 6000.
The separation between the Beovision and Beomaster carrier frequencies is 1430 Hz, thus preventing interaction between units.

CARRIER FREQUENCY OSCILLATOR

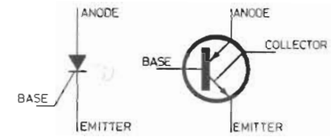


The carrier frequency oscillator operates free-running at a frequency of 47 kHz.
The oscillator circuit consists of 9L1, 9C8 and 9TR3. With e. g. button 1 operated, the oscillator will be tuned to 36.86 kHz by 9C11 and 9C12, the minus terminal of the battery being connected to chassis potential through 9D5 and 9D2.
Diodes 9D4, 9D6 and 9D7 operate as blocking diodes so that the other capacitors will not affect the 36.86 kHz circuit.
Approx. 25 V_{pp} is present at the collector of 9TR3, and 9L1 steps this voltage up to approx. 210 V_{pp}, which signal is peak-rectified across the network composed of 9C18 and 9D10, thus providing the DC voltage required to obtain the fundamental frequency out of the microphone.
9R12 provides a means of adjusting the current in the oscillator stage.

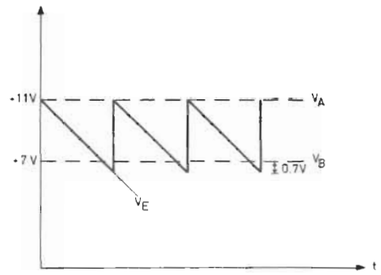


MODULATION FREQUENCY GENERATOR

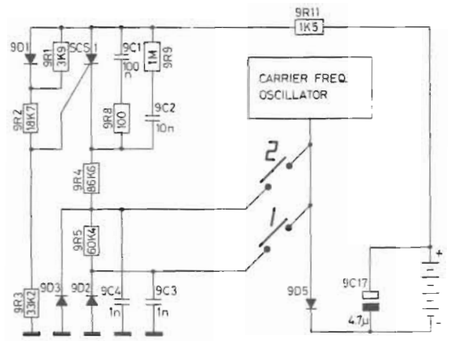
The generator uses an SCS (Silicon Controlled Switch) thyristor.



At the moment of start-up, the base bias is + 7 V, and 9C1 may be regarded as a short-circuit. The thyristor is OFF. The voltage across 9C1 rises, and the emitter voltage of 9SCS1 falls until it reaches a level of 0.7 V below the base bias; then the thyristor goes ON and 9C1 discharges. The thyristor goes OFF, and the pulse sequence starts all over again.

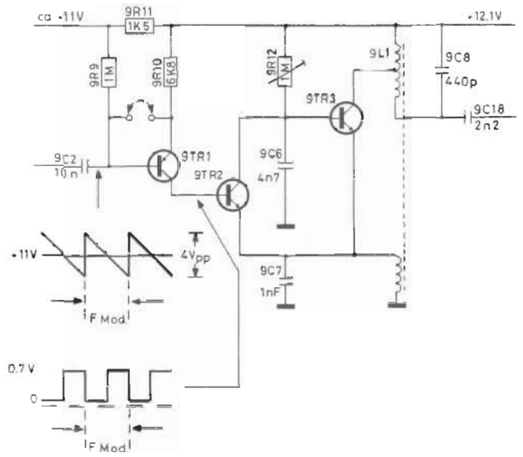


9C1, 9R8 and the emitter resistor of 9SCS1 determine the frequency of the sawtooth voltage. In practice, the generator is tuned by altering the emitter resistor.



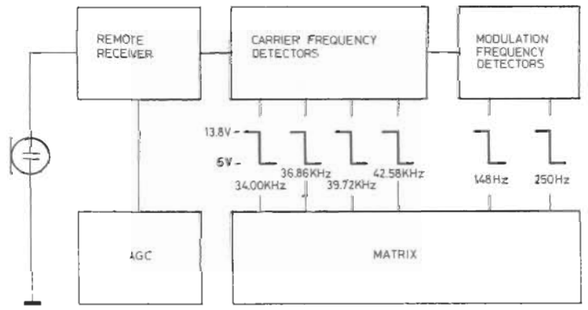
If e. g. button 1 is operated, the minus terminal of the battery is connected to chasses potential through 9D5 and 9D2. The emitter resistor of 9SCS1 will then consist of R4 + R5, and the generator delivers a 148 Hz signal.
The cathode of 9D3 will carry a positive voltage, causing 9D3 to be blocked.
Capacitors 9C3 and 9C4 prevent radiation from the carrier frequency oscillator from making the diodes conductive. 9D1 ensures tracking between the battery voltage and the thyristor's base bias so that the modulation frequencies are kept constant during discharge of the battery.

MODULATOR

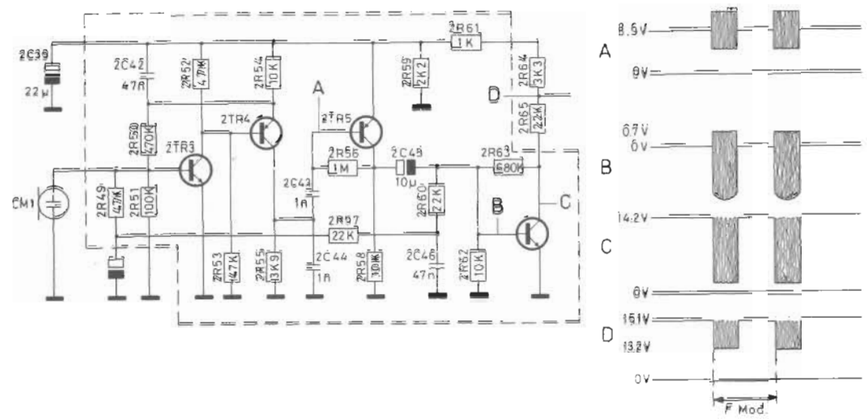


The modulator circuit is built up around transistors 9TR1 and 9TR2. When the modulation frequency signal is applied to the base of 9TR1, the signal will be centered around the DC level at the base, due to 9C2.
The positive portion of the sawtooth pulse causes 9TR1 to go OFF. When the sawtooth pulse goes negative, 9TR1 goes ON. This causes positive bias to be applied to 9TR2, thereby bringing it ON. The result is that the base of 9TR3 is pulled towards its emitter, causing it to go OFF. The carrier frequency oscillator stops operating, from which it will be seen that the oscillator is modulated 100% during the negative half-cycle.

REMOTE RECEIVER



Ultrasound pulses from the transmitter are picked up by 2CM1 and amplified by 2TR3 and 2TR4. To reduce the self-noise and hence the gain of 2TR3, the transistor is controlled with a low value of base current, determined by the voltage divider composed of 2R50 and 2R51 (DC feedback from the emitter of 2TR4). The low self-noise level is important in preventing noise from activating the following carrier-frequency and modulation-frequency detectors.
A screen can protects the receiver proper from picking up noise pulses from outside.

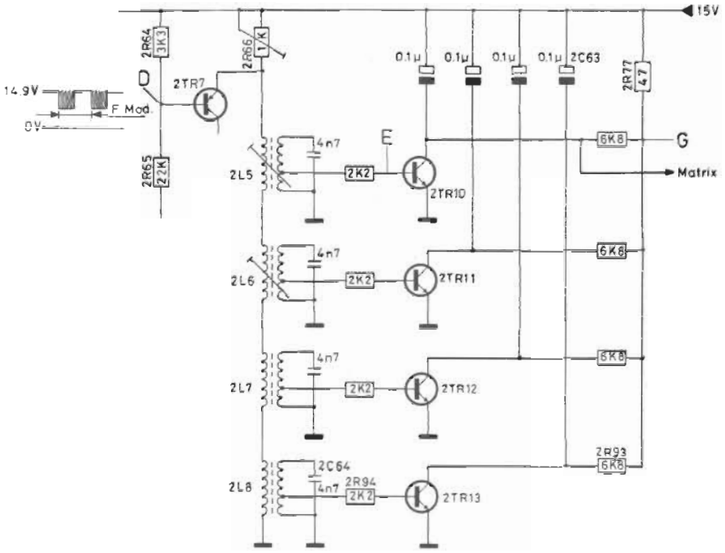


The bias at the base of 2TR5 will have a value of approx. 8.9 V, around which DC level the signal will be centered (A). 2C45 has relatively high capacitance since it is part of the AGC circuit, in addition to being RF coupling capacitor. 2R63 supplies 2TR6 with a low value of base bias. A signal at the base of 2TR6 will cause the transistor to go ON, and the positive portion of the signal is clamped to the base bias (B). At the moment when 2TR6 goes ON, the voltage at the collector jumps from approx. 14.2 V to approx. 0 V (C).
Since the collector resistor is composed of two resistors, the voltage at point D will be determined by the voltage division ratio, approx. 7 : 1, provided by 2R65 and 2R64.
The voltage at point D will then jump from approx. 15.1 V to approx. 13.2 V when 2TR6 goes ON.

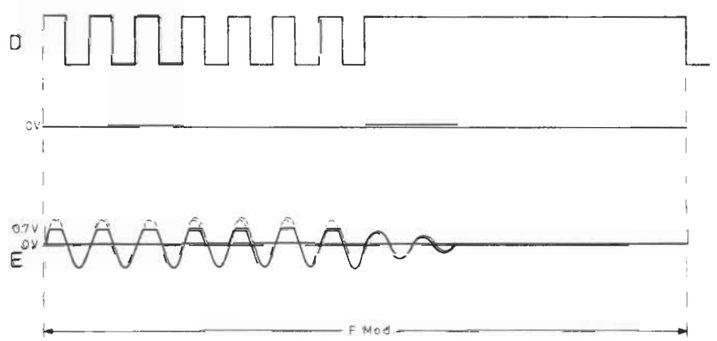
AGC

The AGC circuit comprises 2TR6 and the voltage divider 2R60, 2R57, 2R49 and 2R51, as well as capacitors 2C45, 2C46 and 2C41. With no signal passing through the receiver, approx. 0.2 V will be present at the base of 2TR6. When a signal is fed to the circuit, the transistor will go ON, and the base signal will be clamped to 0.7 V.
At a given signal level, 2C41 will charge to a level determined by the ratio between the AGC voltage divider and the 2TR3 base-bias divider. A stronger signal will cause the mean value of the signal at the base of 2TR6 to provide a negative-going voltage drop across 2R62. 2C41 will then discharge; the base bias of 2TR3 will be regulated down; and the gain of the stage will be reduced.
Capacitor 2C46 is part of a time constant network to prevent any brief noise pulses from causing AGC control.

CARRIER FREQUENCY DETECTORS

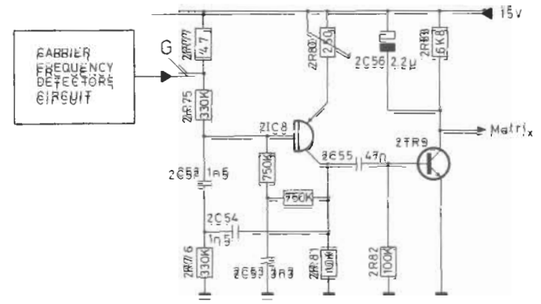


The carrier frequency detector circuit consists of four electrically identical circuits built up around transistors 2TR7, 10, 11, 12 and 13. Each detector is tuned to one of the carrier frequencies employed. The circuits convert the carrier frequency signal in question to a voltage jump which is applied to the matrix circuit. The following analysis covers only one of the circuits (34.00 kHz).



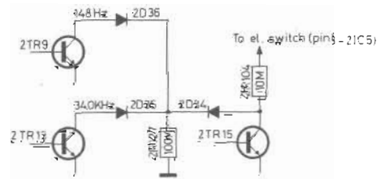
The high-frequency voltage jumps at point D (34.00 kHz activated on the Control Module) cause 2TR7 to go ON. Current pulses at the collector of 2TR7 and the oscillator circuit 2L8, 2C64, tuned to 34.00 kHz, starts generating sinusoidal oscillation. The positive halves of the sinusoidal oscillation will now, via 2R94, cause 2TR13 to go ON, and the collector voltage of 2TR13 goes from 13.8 V to approx. 6 V. The result is that 2C63 charges to approx. 9 V.
During the negative half-cycle, 2TR13 will go OFF, but 2C63 on account of its charge will keep the voltage at the collector of 2TR13 down until the transistor again goes ON.

MODULATION FREQUENCY DETECTORS



The circuit of both modulation frequency detectors are identical for which reason only the 148-Hz detector is described here.
The detector may be regarded as a selective bandpass filter which at its resonant frequency (148 Hz) provides negative feedback from the collector to the base of 2IC8. The point of resonance is adjustable with 2R80.
At point G a signal will be present which contains the modulation frequency signal. When this signal is applied to the detector, a signal will appear at the collector of 2IC8. This signal is applied to the base of 2TR9 via 2C55, and the positive half-cycles of the signal will bring the transistor ON, causing the collector voltage to go towards 0 V and 2C56 to pick up a charge.
When the transistor goes OFF during the negative half-cycle, 2C56 on account of its charge will retain the level until the next positive half-cycle.

MATRIX

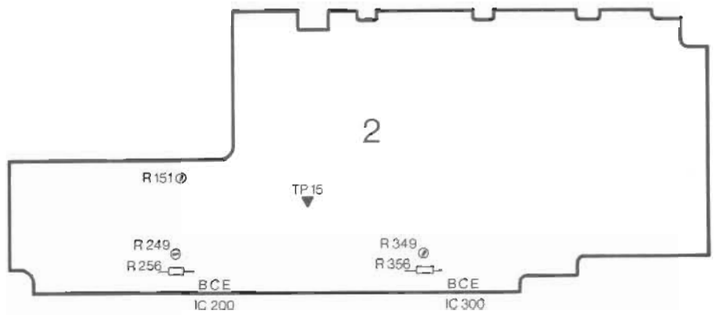


When e. g. the Phono button on the Control Module is operated, the frequencies of 34.00 kHz and 148 Hz are activated. This causes negative-going voltage jumps at the collectors of 2TR13 and 2TR9, respectively. These voltage jumps are applied to the anodes of diodes 2D35 and 2D36. This causes them to go OFF, and the collector of 2TR15 is connected to chassis potential through 2D34 and 2R127. The voltage at the collector of 2TR15 will be approx. 9 V, and the electronic switch will set itself to the Phono position. The operation of the electronic switch is explained in the Service Manual for Beomaster 1900, page 6 - 2.

ADJUSTMENTS

15–VOLT SUPPLY

With the receiver switched to FM, adjust 2R151 so that 15 volts is present at 2TP15.



NO–SIGNAL CURRENT

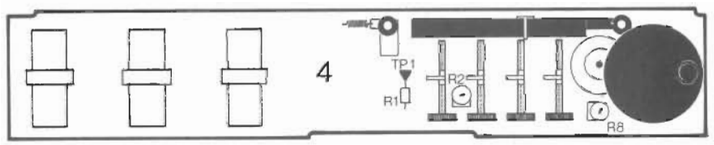
No-signal current is adjusted while the receiver is cold and with the volume control turned down.

Speakers must not be connected.

With 2R249 (2R239) adjust for 25 mA collector current in 2IC200 (2IC300) or –12 mV across 2R256 (2R356).
When the receiver has been on for ten minutes, with the volume control turned down, check the no-signal current and again adjust for 25 mA or 12 mV across the emitter resistor.

TUNING VOLTAGE

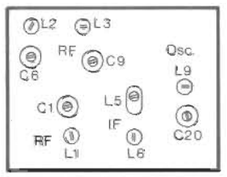
With receiver switched to FM 1 and potentiometer 4R3 turned against the stop at 88 MHz, adjust 4R2 so that 4.5 volts is present at 4TP1.



With receiver switched to FM 5 and potentiometer 4R7 turned against stop at 88 MHz, adjust 4R8 so that 4.6 volts is present at 4TP1.

FRONT END, TUNER

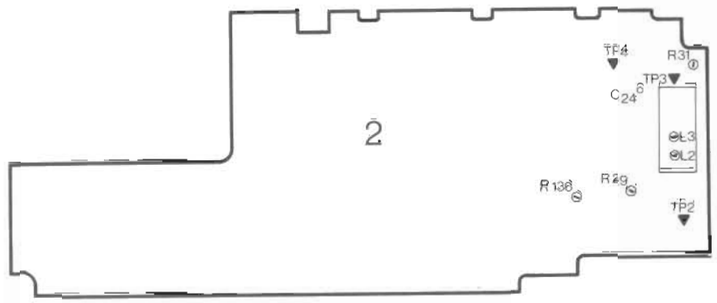
Set tuning control to 89 MHz and sweep generator to 89 MHz.
With 1L1, 1L2, 1L3 and 1L9 adjust for max. IF curve at 2TP2.
Set tuning control to 106 MHz and sweep generator to 106 MHz.
With 1C1, 1C6, 1C9 and 1C20 adjust for max. IF curve at 2TP2.
Check dial accuracy and repeat adjustment if necessary.



Set tuning control to 97 MHz and sweep generator to 97 MHz. With 1L5 and 1L6 adjust for max. IF curve at 2TP2.

DETECTOR

Adjust 2L2 for max. S-curve, measured at 2TP3.
Set tuning control so that no signal is being received and adjust 2L3 so that 0 volts is present at 2TP3.



BALANCE LIGHT

Short 2TP3 to chassis and adjust 2R31 for equal brightness of the two lamps.

DECODER

Short 2TP3 to chassis.
With 2C24 adjust the internal oscillator to exactly 19 kHz as measured at 2TP4.
The accuracy can be checked in two ways:

1. Connect frequency counter to 2TP4.
2. Apply 19 kHz from 2TP4 to y-input of oscilloscope and 19 kHz from a stereo decoder to x-input of the oscilloscope.

When the Lissajous figure is stationary, adjustment is correct.
A third possible way to adjust the internal oscillator is as follows:

3. Remove short-circuit and tune receiver to a stereo program.
   Turn 2C24 to one side until the stereo lamp turns off. Thereafter turn 2C24 to the other side until the stereo lamp turns off.
   The setting midway between these two settings represents correct adjustment.

Coil 2L4 is factory pre-adjusted to 114 kHz and should not be touched.

CHANNEL SEPARATION

Connect stereo decoder to aerial input, f mod 1 kHz, Δf 40 kHz, pilot 8=10%, AFC on.
Connect wattmeter to amplifier output. Treble control at min.
With 2R29 adjust for min. output in the unmodulated channel. Make this adjustment both with unmodulated left channel and unmodulated right channel.

ADJUSTMENT OF LEVEL

Volume set at MEDIUM and receiver switched to TAPE.
Connect tone generator to TAPE input, 200 mV, 1 kHz. Connect millivoltmeter to speaker output. With 2R136 adjust for 100 mV at output.

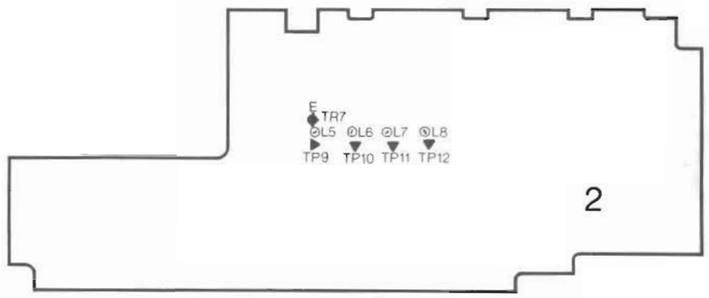
REMOTE-CONTROL RECEIVER ADJUSTMENTS

Instruments and Aids:

Dual-beam oscilloscope
AF voltmeter, e. g. B&O RV9
Milliammeter
Stabilised power supply, 11.8 V, e. g. B&O SN14
Frequency standard, index. No. 8052088
Shorting plug, index No. 7220054

CARRIER FREQUENCY DETECTORS

A Beomaster 6000 frequency standard is required for adjustments. Set the X-deflection of a dual-beam oscilloscope to 10 µS/cm. Set the Y1 switch to 0.5 V/cm and the Y2 switch to 0.5 V/cm. Adjust the beams to the middle of the screen and switch the oscilloscope to the AC position. Be sure to check if the probes are correctly adjusted.
Turn off the modulation on the frequency standard by means of the switch on the left-hand side of the frequency standard.

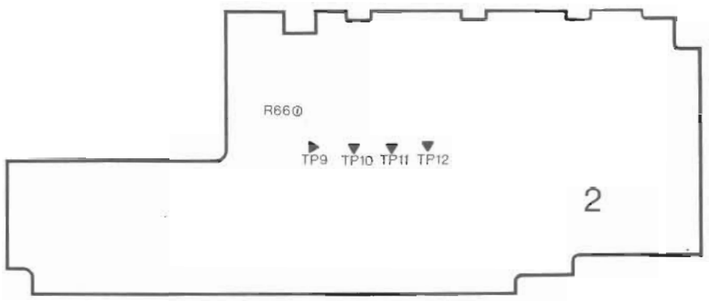


Connect the Y1 input to TP12. Connect Y2 to the emitter of 2TR7.
Activate the frequency standard at 34.00 kHz and place it so close to the receiver microphone that the curves appear clearly. Adjust 2L8 for phase coincidence on oscilloscope. This means that the square-wave curve is located symmetrically around the sine-wave curve with the corners of the square-wave curve only just touching the sine-wave curve, as shown in the sketch below.

Connect Y1 to TP11. Activate the frequency standard at 36.86 kHz and adjust 2L7 for phase coincidence on oscilloscope.
Connect Y1 to TP10. Activate the frequency standard at 39.72 kHz and adjust 2L6 for phase coincidence on oscilloscope.
Connect Y1 to TP9. Activate the frequency standard at 42.58 kHz and adjust 2L5 for phase coincidence on oscilloscope.

AMPLITUDE

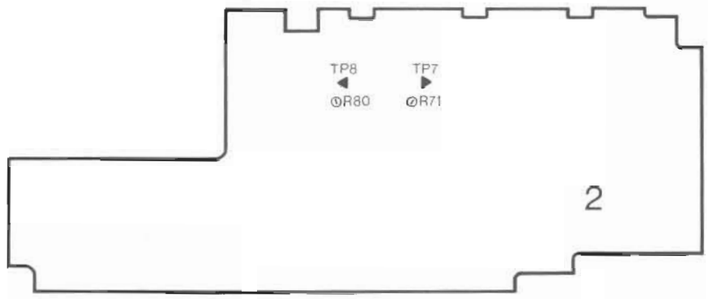
Place the frequency standard as close to the receiver microphone as possible.
The modulation should remain turned off.



Connect an AF voltmeter to TP12. Activate the frequency standard at 34.00 kHz and adjust trimmer potentiometer 2R66 for 1-V voltmeter reading.
Connect the AF voltmeter to TP11. Activate the frequency standard at 36.86 kHz and check that the voltage reading does not deviate more than ± 1 dB from 1 V. If the deviation is greater than this, see text below unter NOTE.
Connect the AF voltmeter to TP10. Activate the frequency standard at 39.72 kHz and check that the voltage reading does not deviate more than ± 1 dB from 1 V. If the deviation is greater, see text below unter NOTE.
Connect the AF voltmeter to TP9. Activate the frequency standard at 42.58 kHz and check that the voltage reading does not deviate more than ± 1 dB from 1 V. If the deviation is greater, see text below under NOTE.

NOTE: The requirement for the amplitude adjustment is that the difference between the highest and lowest measured values must not exceed 2 dB. If the difference is greater than 2 dB, cut approx. 1 mm off the core in the coil having the lowest voltage value (1 mm corresponds to approx. 1.5 dB).
In the event that you cut from a given core, be sure to adjust the carrier frequency detector in question.

MODULATION FREQUENCY DETECTORS



Turn on the modulation on the frequency standard and place the frequency standard as close to the receiver microphone as possible.

Connect an AF voltmeter and an oscilloscope to TP8. Set the oscilloscope Y-deflection to 2 V/cm and the X-deflection to 1 mS/cm. Each one of the buttons of the frequency standard to obtain modulation at 148 Hz.
With trimmer potentiometer 2R80 adjust so that a 1-V reading is obtained on the AF voltmeter.
Having made this adjustment, release the button on the frequency standard and check on the oscilloscope that the circuit dies out quickly. If it does not, the most probable reason is that an error was made while making the adjustment. Therefore again follow the procedure for adjustment of modulation frequency detectors.
Connect AF voltmeter and oscilloscope to TP7.
Push one of the buttons of the frequency standard so that 250 Hz modulation is obtained. With trimmer potentiometer 2R71 adjust for 1-V reading on the AF voltmeter.
When you release the button of the frequency standard check that the circuit dies out quickly, as when making the 148 Hz adjustment.

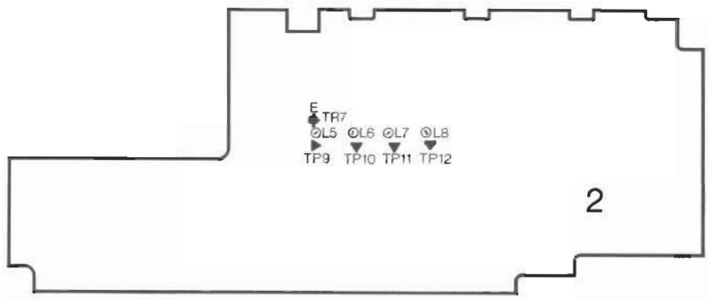
CONTROL MODULE ADJUSTMENT

CURRENT DRAIN

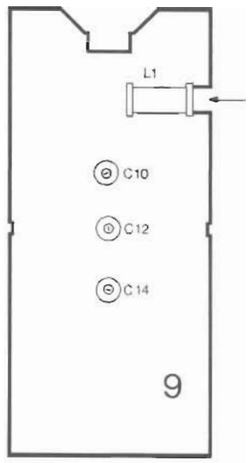
Take off bottom plate.
Apply 11.8 V from the external power supply to the Control Module, in series with a milliammeter.
Turn off the modulation by shorting the base and emitter of 9TR1 together (for example by inserting a shorting plug, index No. 7220054, in the socket).

Operate the PHONO button on the Control Module and adjust 9R12 so that a drain of 6 mA is measured.

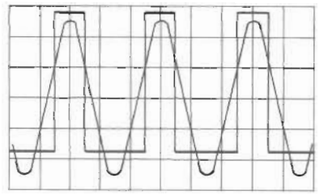
CARRIER FREQUENCIES



A CORRECTLY ADJUSTED RECEIVER IS REQUIRED FOR THIS ADJUSTMENT:
Connect the Control Module to the external 11.8 V power supply.
Adjust the X-deflection of a dual-beam oscilloscope to 10 µS/cm and set the Y-inputs to 0.5 V/cm. Place the beams in the middle of the screen and set the oscilloscope to the AC position.
Connect the Y1 input to the emitter of 2TR7 and Y2 to TP12 (coil side of 2R94).



Activate the Control Module at 34.00 kHz (Phono or 0) and adjust 9L1 for phase coincidence on oscilloscope. This means that the square-wave curve is placed symmetrically around the sine-wave curve as shown in the sketch below.



Connect Y2 to TP11 (coil side of 2R91).
Activate 36.86 kHz (1 or 2) and adjust 9C12 for phase coincidence on oscilloscope.
Connect Y2 to TP10 (coil side of 2R88).
Activate 39.72 kHz (3 or 4) and adjust 9C14 for phase coincidence on oscilloscope.
Connect Y2 to TP9 (coil side of 2R85). Activate 42.58 kHz (volume up or down) and adjust 9C10 for phase coincidence on oscilloscope.

ELECTRICAL PARTS LIST

0R200	5001019	220 ohms 10% 1/2W	0C1	4010018	1 nF 250V
0R300	5001019	220 ohms 10% 1/2W	0C2	4010018	1 nF 250V
			0C3	4010018	1 nF 250V
			0C4	4010018	1 nF 250V
			0C5	4010018	1 nF 250V
			0C6	4010018	1 nF 250V
			0C7	4200305	5000 µF 35V
			0C8	4200305	5000 µF 35V

FRONT END, TUNER 8050054, PC 1

R1	5001050	47 kohms 10% 1/2W	R9	5001013	100 ohms 10% 1/2W
R2	5001062	330 kohms 10% 1/2W	R10	5001040	6.8 kohms 10% 1/2W
R3	5001013	100 ohms 10% 1/2W	R11	5010141	27 kohms 5% 1/8W
R4	5001062	330 kohms 10% 1/2W	R12	5010041	5.6 kohms 5% 1/8W
R5	5001013	100 ohms 10% 1/2 W	R13	5010067	560 ohms 5% 1/8W
R6	5001050	47 kohms 10% 1/2W	R14	5010411	47 ohms 5% 1/8W
R7	5010076	3.3 kohms 5% 1/8W	R15	5001047	27 kohms 10% 1/2W
R8	5001038	4.7 kohms 10% 1/2W			

C1	4330001	1 - 9 pF Cer.	C12	4003059	22 pF 5% 250V
C2	4010008	1 nF –20 +50% 400V	C13	4130081	10 nF 20% 250V
C3	4010008	1 nF –20 +50% 400V	C14	4101007	220 pF 5% 63V
C4	4010008	1 nF –20 +50% 400V	C15	4200107	10 µF 10V
C5	4010008	1 nF –20 +50% 400V	C16	4010008	1 nF –20 +50% 400V
C6	4330001	1 - 9 pF Cer.	C17	4010008	1 nF –20 +50% 400V
C7	4010008	1 nF –20 +50% 400V	C18	4000015	8.2 pF 0.25 pF 63V
C8	4003012	3.3 pF 0.25 pF 400V	C19	4003130	47 pF 2% 63V
C9	4330001	1 - 9 pF Cer.	C20	4330001	1 - 9 pF Cer.
C10	4010008	1 nF –20 +50% 400V	C21	4005004	6.8 pF 0.5 pF 400V
C11	4010008	1 nF –20% +50% 400V	C22	4101031	270 pF 5% 63V

L1	8020120	RF-coil	L8	6830052	3.8 µH 5%
L2	8020121	RF-coil, prim.	L9	8020183	Osc.
L3	8020122	RF-coil, sec.	L10	6830052	3.8 µH 5%
L4	6710001	Ferrit-tube		6702001	Ferritcore F 100 (r)
L5	8020124	10.7 MHz		6702008	Ferritcore F 10 (wh)
L6	8020137	10.7 MHz		6479001	Glassbushing
L7	6830052	3.8 µH 5%			

IF SECTION, DECODER, PROGRAM SELECTION, AF AMPLIFIER 8002282, PC 2

R1	5010054	1 Mohms 5% 1/8W	R34	5010622	39 ohms 5% 1/8W
R2	5010059	10 kohms 5% 1/8W	R35	5010074	680 kohms 5% 1/8W
R3	5010060	39 kohms 5% 1/8W	R36	5010411	47 ohms 5% 1/8W
R4	5010040	1 kohms 5% 1/8W	R37	5010074	680 kohms 5% 1/8W
R5	5010044	330 ohms 5% 1/8W	R38	5010063	150 kohms 5% 1/8W
R6	5010247	1.5 kohms 5% 1/8W	R39	5010077	470 kohms 5% 1/8W
R7	5010067	560 ohms 5% 1/8W	R40	5010077	470 kohms 5% 1/8W
R8	5010041	5.6 kohms 5% 1/8W	R41	5010045	47 kohms 5% 1/8W
R9	5010070	390 ohms 5% 1/8W	R42	5010045	47 kohms 5% 1/8W
R10	5010044	330 ohms 5% 1/8W	R43	5010079	22 kohms 5% 1/8W
R11	5010067	560 ohms 5% 1/8W	R44	5010079	22 kohms 5% 1/8W
R12	5010448	22 ohms 5% 1/8W	R45	5010079	22 kohms 5% 1/8W
R13	5010044	330 ohms 5% 1/8W	R46	5010079	22 kohms 5% 1/8W
R14	5010068	820 ohms 5% 1/8W	R47	5010053	15 kohms 5% 1/8W
R15	5010065	100 ohms 5% 1/8W	R49	5010045	47 kohms 5% 1/8W
R16	5010000	270 ohms 5% 1/8W	R50	5010077	470 kohms 5% 1/8W
R17	5010247	1.5 kohms 5% 1/8W	R51	5010049	100 kohms 5% 1/8W
R18	5010247	1.5 kohms 5% 1/8W	R52	5010045	47 kohms 5% 1/8W
R19	5010046	12 kohms 5% 1/8W	R53	5010045	47 kohms 5% 1/8W
R20	5010041	5.6 kohms 5% 1/8W	R54	5010059	10 kohms 5% 1/8W
R21	5001017	180 ohms 10% 1/2W	R55	5010069	3.9 kohms 5% 1/8W
R22	5010045	47 kohms 5% 1/8W	R56	5010054	1 Mohms 5% 1/8W
R23	5001010	68 ohms 10% 1/2W	R57	5010079	22 kohms 5% 1/8W
R24	5020034	18.7 kohms 1% 1/8W	R58	5010059	10 kohms 5% 1/8W
R25	5010092	220 ohms 5% 1/8W	R59	5010064	2.2 kohms 5% 1/8W
R26	5010040	1 kohms 5% 1/8W	R60	5010079	22 kohms 5% 1/8W
R27	5010049	100 kohms 5% 1/8W	R61	5010040	1 kohms 5% 1/8W
R28	5010298	2.7 kohms 5% 1/8W	R62	5010059	10 kohms 5% 1/8W
R29	5370068	25 kohms 20% LIN.	R63	5010074	680 kohms 5% 1/8W
R30	5010060	39 kohms 5% 1/8W	R64	5010076	3.3 kohms 5% 1/8W
R31	5370068	25 kohms 20% LIN.	R65	5010079	22 kohms 5% 1/8W
R32	5010083	270 kohms 5% 1/8W	R66	5370050	1 kohms 20% LIN.
R33	5010054	1 Mohms 5% 1/8W	R66a	5010056	82 ohms 5% 1/8W

PC 2 CONTD.

R67	5010498	200 kohms 2% 1/4W	R146	5010052	6.8 kohms 5% 1/8 W
R68	5010498	200 kohms 2% 1/4W	R147	5020247	1.5 kohms 5% 1/8W
R69	5010501	430 kohms 2% 1/4W	R148	5001025	560 ohms 10% 1/2W
R70	5010501	430 kohms 2% 1/4W	R149	5010048	4.7 kohms 5% 1/8W
R71	5370174	250 ohms 20% LIN.	R150	5010064	2.2 kohms 5% 1/8W
R72	5010059	10 kohms 5% 1/8W	R151	5370050	1 kohms 20% LIN.
R73	5010049	100 kohms 5% 1/8W	R152	5010049	100 kohms 5% 1/8W
R74	5010052	6.8 kohms 5% 1/8W	R153	5010141	27 kohms 5% 1/8W
R75	5010117	330 kohms 5% 1/8W	R154	5010046	12 kohms 5% 1/8W
R76	5010117	330 kohms 5% 1/8W	R155	5010059	10 kohms 5% 1/8W
R77	5010411	47 ohms 5% 1/8W	R156	5010064	2.2 kohms 5% 1/8W
R78	5010503	750 kohms 2% 1/4W	R157	5010054	1 Mohms 5% 1/8W
R79	5010503	750 kohms 2% 1/4W	R158	5010431	2.7 Mohms 10% 1/8W
R80	5370174	250 ohms 20% LIN.	R159	5010054	1 Mohms 5% 1/8W
R81	5010059	10 kohms 5% 1/8W	R200	5010048	4.7 kohms 5% 1/8W
R82	5010049	100 kohms 5% 1/8W	R201	5010505	820 kohms 5% 1/8W
R83	5010052	6.8 kohms 5% 1/8W	R202	5010049	100 kohms 5% 1/8W
R84	5010052	6.8 kohms 5% 1/8W	R203	5010059	10 kohms 5% 1/8W
R85	5010064	2.2 kohms 5% 1/8W	R204	5010144	680 ohms 5% 1/8W
R87	5010052	6.8 kohms 5% 1/8W	R205	5010040	1 kohms 5% 1/8W
R88	5010064	2.2 kohms 5% 1/8W	R206	5010061	56 kohms 5% 1/8W
R90	5010052	6.8 kohms 5% 1/8W	R207	5010058	470 ohms 5% 1/8W
R91	5010064	2.2 kohms 5% 1/8W	R208	5010141	27 kohms 5% 1/8W
R93	5010052	6.8 kohms 5% 1/8W	R209	5010054	1 Mohms 5% 1/8W
R94	5010064	2.2 kohms 5% 1/8W	R210	5010046	12 kohms 5% 1/8W
R96	5010067	560 ohms 5% 1/8W	R211	5010072	180 kohms 5% 1/8W
R97	5010141	27 kohms 5% 1/8W	R212	5010066	1.8 kohms 5% 1/8W
R98	5001019	220 ohms 10% 1/2W	R213	5010048	4.7 kohms 5% 1/8W
R99	5001019	220 ohms 10% 1/2W	R214	5010058	470 ohms 5% 1/8W
R100	5010045	47 kohms 5% 1/8W	R215	5010048	4.7 kohms 5% 1/8W
R101	5010046	12 kohms 5% 1/8W	R216	5010054	1 Mohms 5% 1/8W
R102	5010049	100 kohms 5% 1/8W	R217	5010048	4.7 kohms 5% 1/8W
R103	5010049	100 kohms 5% 1/8W	R218	5011078	4.7 Mohms 10% 1/4W
R104	5010638	10 Mohms 10% 1/8W	R219	5010054	1 Mohms 5% 1/8W
R105	5010049	100 kohms 5% 1/8W	R220	5010048	4.7 kohms 5% 1/8W
R106	5010049	100 kohms 5% 1/8W	R221	5010054	1 Mohms 5% 1/8W
R107	5010638	10 Mohms 10% 1/8W	R222	5010048	4.7 kohms 5% 1/8W
R108	5010049	100 kohms 5% 1/8W	R223	5010091	82 kohms 5% 1/8W
R109	5010049	100 kohms 5% 1/8W	R224	5010075	33 kohms 5% 1/8W
R110	5010638	10 Mohms 10% 1/8W	R225	5010154	8.2 kohms 5% 1/8W
R111	5010049	100 kohms 5% 1/8W	R226	5010135	18 kohms 5% 1/8W
R112	5010049	100 kohms 5% 1/8W	R227	5010117	330 kohms 5% 1/8W
R113	5010049	100 kohms 5% 1/8W	R228	5010047	120 kohms 5% 1/8W
R114	5010638	10 Mohms 10% 1/8W	R229	5010076	3.3 kohms 5% 1/8W
R115	5010049	100 kohms 5% 1/8W	R230	5010153	1.2 kohms 5% 1/8W
R116	5010049	100 kohms 5% 1/8W	R231	5010141	27 kohms 5% 1/8W
R117	5010049	100 kohms 5% 1/8W	R232	5010298	2.7 kohms 5% 1/8W
R118	5010638	10 Mohms 10% 1/8W	R233	5010059	10 kohms 5% 1/8W
R119	5010049	100 kohms 5% 1/8W	R234	5010045	47 kohms 5% 1/8W
R120	5010049	100 kohms 5% 1/8W	R235	5010053	15 kohms 5% 1/8W
R121	5010049	100 kohms 5% 1/8W	R236	5010144	680 ohms 5% 1/8W
R122	5010638	10 Mohms 10% 1/8W	R237	5010403	27 ohms 5% 1/8W
R123	5010049	100 kohms 5% 1/8W	R238	5010046	12 kohms 5% 1/8W
R124	5010049	100 kohms 5% 1/8W	R239	5010044	330 ohms 5% 1/8W
R125	5010049	100 kohms 5% 1/8W	R240	5010058	470 ohms 5% 1/8W
R126	5010638	10 Mohms 10% 1/8W	R241	5010092	220 ohms 5% 1/8W
R127	5010049	100 kohms 5% 1/8 W	R242	5010448	22 ohms 5% 1/8W
R128	5010049	100 kohms 5% 1/8W	R243	5010144	680 ohms 5% 1/8W
R129	5010049	100 kohms 5% 1/8W	R244	5010144	680 ohms 5% 1/8W
R130	5010638	10 Mohms 10% 1/8W	R245	5010058	470 ohms 5% 1/8W
R131	5010049	100 kohms 5% 1/8W	R246	5010045	47 kohms 5% 1/8W
R132	5010049	100 kohms 5% 1/8W	R247	5010053	15 kohms 5% 1/8W
R133	5010049	100 kohms 5% 1/8W	R248	5001020	270 ohms 10% 1/2W
R134	5010049	100 ohms 10% 1/2W	R249	5370174	250 ohms 20% LIN.
R135	5010064	2.2 kohms 5% 1/8W	R250	5010044	330 ohms 5% 1/8W
R136	5370050	1 kohms 20% LIN.	R251	5010128	120 ohms 5% 1/8W
R137	5010153	1.2 kohms 5% 1/8W	R252	5010046	12 kohms 5% 1/8W
R138	5010739	200 ohms 5% 1/4W	R253	5010046	12 kohms 5% 1/8W
R139	5010144	680 ohms 5% 1/8W	R254	5010067	560 ohms 5% 1/8W
R140	5010059	10 kohms 5% 1/8W	R255	5010067	560 ohms 5% 1/8W
R141	5010054	1 Mohms 5% 1/8W	R256	5100203	0.47 ohms 10% 2W
R143	5010069	3.9 kohms 5% 1/8W	R257	5100203	0.47 ohms 10% 2W
R144	5010064	2.2 kohms 5% 1/8W	R258	5010045	47 kohms 5% 1/8W
R145	5010059	10 kohms 5% 1/8W	R259	5000085	4.7 ohms 10% 1/2W
R145a	5010069	3.9 kohms 5% 1/8 W	R260	5010045	47 kohms 5% 1/8W

PC 2 CONTD.

C1	4010041	10 nF –20 +100% 40V	C73	4000035	3.3 pF 0.25 pF 63V
C2	4130107	100 nF 10% 250V	C74	4010060	22 nF –20 +100% 40V
C3	4010060	22 nF –20 +100% 40V	C75	4000035	3.3 pF 0.25 pF 63V
C4	4010060	22 nF –20 +100% 40V	C76	4010060	22 nF –20 +100% 40V
C5	4010060	22 nF –20 +100% 40V	C77	4000035	3.3 pF 0.25 pF 63V
C6	4010027	1 nF 10% 100V	C78	4010060	22 nF –20 +100% 40V
C7	4010041	10 nF –20 +100% 40V	C79	4000035	3.3 pF 0.25 pF 63V
C8	4010041	10 nF –20 +100% 40V	C80	4010060	22 nF –20 +100% 40V
C9	4010041	10 nF –20 +100% 40V	C81	4000035	3.3 pF 0.25 pF 63V
C10	4010041	10 nF –20 +100% 40V	C82	4010060	22 nF –20 +100% 40V
C11	4010041	10 nF –20 +100% 40V	C83	4000035	3.3 pF 0.25 pF 63V
C12	4010041	10 nF –20 +100% 40V	C84	4010060	22 nF –20 +100% 40V
C13	4003124	56 pF 2% 63V	C85	4000035	3.3 pF 0.25 pF 63V
C14	4003135	39 pF 5% 63V	C86	4010060	22 nF –20 +100% 40V
C15	4000035	3.3 pF 0.25 pF 63V	C87	4000035	3.3 pF 0.25 pF 63V
C16	4003130	47 pF 2% 63V	C88	4201065	10 µF 63V
C17	4003130	47 pF 2% 63V	C89	4200099	100 µF 16V
C18	4201065	10 µF 63V	C90	4200097	220 µF 16V
C19	4003130	47 pF 2% 63V	C91	4200098	100 µF 6,3V
C20	4200296	2.2 µF 63V	C92	4200332	2200 µF 25V
C21	4130087	47 nF 10% 250V	C93	4010027	1 nF 10% 100V
C22	4010031	680 pF 10% 100V	C94	4010027	1 nF 10% 100V
C23	4200097	220 µF 16V	C95	4130107	100 nF 10% 250V
C24	4340003	60 pF foil	C96	4130107	100 nF 10% 250V
C25	4100044	440 pF 1% 63V	C97	4201065	10 µF 63V
C26	4130104	220 nF 20% 100V	C98	4200100	22 µF 40V
C27	4201058	0.47 µF 35V	C99	4200092	47 µF 16V
C28	4130114	470 nF 10% 100V	C100	4130107	100 nF 10% 250V
C29	4130107	100 nF 10% 250V	C101	4010027	1 nF 10% 100V
C30	4130104	220 nF 20% 100V	C102	4010027	1 nF 10% 100V
C31	4130104	220 nF 20% 100V	C103	4010027	1 nF 10% 100V
C32	4010060	22 nF –20 +100% 40V	C104	4010027	1 nF 10% 100V
C33	4010060	22 nF –20 +100% 40V	C105	4010027	1 nF 10% 100V
C34	4010060	22 nF –20 +100% 40V	C106	4010027	1 nF 10% 100V
C39	4200100	22 µF 40V	C107	4010027	1 nF 10% 100V
C41	4200298	1 µF 63V	C108	4010027	1 nF 10% 100V
C42	4030015	47 nF –20 +80% 12V	C200	4010063	4.7 nF 10% 63V
C43	4010027	1 nF 10% 100V	C201	4200296	2.2 µF 63V
C44	4010027	1 nF 10% 100V	C202	4200296	2.2 µF 63V
C45	4201065	10 µF 63V	C203	4200296	2.2 µF 63V
C46	4030015	47 nF –20 +80% 12V	C204	4201061	4.7 µF 63V
C47	4100057	1.5 nF ± 2.5 % 63V	C205	4201058	0.47 µF 35V
C47a	4200099	100 µF 16V	C206	4010037	390 pF 10% 100V
C48	4100058	3.3 nF 2.5 % 63V	C207	4100058	3.3 nF 2.5 % 63V
C49	4100057	1.5 nF 2.5 % 63V	C208	4130109	10 nF 10% 250V
C50	4130087	47 nF 10% 250V	C209	4010037	390 pF 10% 100V
C51	4200296	2.2 µF 63V	C210	4200296	2.2 µF 63V
C52	4100057	1.5 nF 2.5% 63V	C211	4200298	1 µF 63V
C53	4100058	3.3 nF ± 2.5% 63V	C212	4010027	1 nF 10% 100V
C54	4100057	1.5 nF 2.5 % 63V	C213	4200296	2.2 µF 63V
C55	4130087	47 nF 10% 250V	C214	4201061	4.7 µF 63V
C56	4200296	2.2 µF 63V	C215	4200296	2.2 µF 63V
C57	4200169	0.1 µF 35V	C216	4200298	1 µF 63V
C58	4100059	4.7 nF 2.5% 63V	C217	4200296	2.2 µF 63V
C59	4200169	0.1 µF 35V	C218	4201058	0.47 µF 35V
C60	4100059	4.7 nF 2.5% 63V	C219	4200296	2.2 µF 63V
C61	4200169	0.1 µF 35V	C220	4010021	220 pF 10% 100V
C62	4100059	4.7 nF 2.5% 63V	C221	4200098	100 µF 6,3 V
C63	4200169	0.1 µF 35V	C222	4201060	100 µF 40V
C64	4100059	4.7 nF 2.5% 63V	C223	4010060	22 nF –20 +100% 40V
C65	4200100	22 µF 40V	C224	4130109	10 nF 10% 250V
C66	4201065	10 µF 63V	C225	4200100	22 µF 40V
C67	4200100	22 µF 40V	C226	4200100	22 µF 40V
C68	4201065	10 µF 63V	C227	4003130	47 pF 2% 63V
C69	4200298	1 µF 63V	C228	4200100	22 µF 40V
C70	4200298	1 µF 63V	C229	4010060	22 nF –20 +100% 40V
C71	4200099	100 µF 16V	C230	4130104	220 nF 20% 100V
C72	4010060	22 nF –20 +100% 40V	C231	4130104	220 nF 20% 100V

BP1	8030001	10.7 MHz
BP2	8030001	10.7 MHz
LP200	8030008	19/38 kHz
LP300	8030008	19/38 kHz

PC 2 CONTD.

L1	6830052	3.8 µH 5%	L7	8022062	36.86 kHz
L2	8020278	10.7 MHz	L8	8022061	34.00 kHz
L3	8020277	10.7 MHz	L200	6850114	0.5 µH
L4	8022066	114 kHz	L300	6850114	0.5 µH
L5	8022064	42.58 kHz		6702042	Ferritcore F100 (L2 and L3)
L6	8022063	39.72 kHz			

CM1	8470003	Microphone
	3152158	Holder for microphone
	3304054	Screen/housing

F1	6604024	Fuse 2A – 250V F
	7500002	Fuse holder
	7530008	Solder lug
	7500014	Socket for pin
	7500013	Contact pin
	3170041	Insulating bead
	8002293	LDR-unit (VOLUME)

EL.–VOLUME CONTROL 8002292, PC 3

R1	5010046	12 kohms 5% 1/8W	R23	5010654	910 kohms 5% 1/8W
R2	5010049	100 kohms 5% 1/8W	R24	5010077	470 kohms 5% 1/8W
R3	5010638	10 Mohms 10% 1/8W	R25	5010662	7.5 kohms 5% 1/8W
R4	5010638	10 Mohms 10% 1/8W	R26	5010658	5.6 Mohms 10% 1/8W
R5	5010054	1 Mohms 5% 1/8W	R27	5010154	8.2 kohms 5% 1/8W
R6	5010054	1 Mohms 5% 1/8W	R28	5010054	1 Mohms 5% 1/8W
R7	5010061	56 kohms 5% 1/8W	R28a	5010077	470 kohms 5% 1/8W
R8	5010046	12 kohms 5% 1/8W	R29	5010298	2.7 kohms 5% 1/8W
R9	5010117	330 kohms 5% 1/8W	R30	5010067	560 kohms 5% 1/8W
R10	5010054	1 Mohms 5% 1/8W	R31	5010048	4.7 kohms 5% 1/8W
R11	5010049	100 kohms 5% 1/8W	R32	5010153	1.2 kohms 5% 1/8W
R12	5010049	100 kohms 5% 1/8W	R33	5010053	15 kohms 5% 1/8W
R13	5010079	22 kohms 5% 1/8W	R34	5010060	39 kohms 5% 1/8W
R14	5010061	56 kohms 5% 1/8W	R35	5010049	100 kohms 5% 1/8W
R15	5010049	100 kohms 5% 1/8W	R36	5010049	100 kohms 5% 1/8W
R16	5010049	100 kohms 5% 1/8W	R37	5010049	100 kohms 5% 1/8W
R17	5010047	120 kohms 5% 1/8W	R38	5010049	100 kohms 5% 1/8W
R18	5010049	100 kohms 5% 1/8W	R39	5010049	100 kohms 5% 1/8W
R19	5010652	240 kohms 5% 1/8W	R40	5010049	100 kohms 5% 1/8W
R20	5010049	100 kohms 5% 1/8W	R41	5010052	6.8 kohms 5% 1/8W
R21	5010077	470 kohms 5% 1/8W	R42	5010075	33 kohms 5% 1/8W
R22	5010049	100 kohms 5% 1/8W			

C1	4130104	220 nF 20% 100V	C8	4200296	2.2 µF 63V
C2	4011025	3.3 nF 10% 100V	C9	4010060	22 nF –20 +100% 40V
C3	4201069	2.2 µF 35V	C10	4201058	0.47 µF 35V
C4	4201057	1 µF 35V	C11	4000035	3.3 pF 0.25 pF 63V
C5	4201069	2.2 µF 35V	C12	4000035	3.3 pF 0.25 pF 63V
C6	4130107	100 nF 10% 250V	C13	4201058	0.47 µF 35V
C7	4100059	4.7 nF 2.5% 63V			

L1	8022065	100 kHz		7500013	Contact pin

TONE CONTROL, TUNING 8002283, PC 4

R1	5010054	1 Mohms 5% 1/8W	R204	5010052	6.8 kohms 5% 1/8W
R2	5370061	50 kohms 20% LIN.	R205	5010144	680 ohms 5% 1/8W
R3	5300092	100 kohms	R206	5010076	3.3 kohms 5% 1/8W
R4	5300092	100 kohms	R207	5310060	20 kohms LIN.
R5	5300092	100 kohms	R208	5010076	3.3 kohms 5% 1/8W
R6	5300092	100 kohms	R209	5310059	50 kohms 5% 1/8W
R7	5320019	100 kohms	R210	5010144	680 ohms 5% 1/8W
R8	5370068	25 kohms 20% LIN.	R211	5010076	3.3 kohms 5% 1/8W
R9	5010043	1 kohms 5% 1/8W.	R212	5010043	1 kohms 5% 1/8W
R10	5001020	270 ohms 10% 1/2W	R213	5010079	22 kohms 5% 1/8W
R200	5310061	20 kohms SPEC.	R214	5010048	4.7 kohms 5% 1/8W
R201	5010043	1 kohms 5% 1/8W	R215	5010120	220 kohms 5% 1/8W
R202	5010117	330 kohms 5% 1/8W	R216	5010075	33 kohms 5% 1/8W
R203	5010120	220 kohms 5% 1/8W			

PC 4 CONTD.

C1	4201072	0.22 µF 35V	C205	4010027	1 nF 10% 100V
C2	4130101	100 nF 5% 250V	C206	4130101	100 nF 5% 250V
C3	4200099	100 µF 16V	C207	4130101	100 nF 5% 250V
C200	4200298	1 µF 63V	C208	4130097	15 nF 10% 250V
C201	4010027	1 nF 10% 100V	C209	4010027	1 nF 10% 100V
C202	4200296	2,2 µF 63V	C210	4200296	2,2 µF 63V
C203	4130097	15 nF 10% 250V	C211	4200101	10 µF 16V
C204	4010027	1 nF 10% 100V			

3190061	Pointer P5	7400121	Switch PRESET VOL.
3190072	Pointer P1 - P4	7402088	Switch, AFC/STEREO/ LOUDNESS
7210020	Socket 3		
7210096	Socket 8		
7210097	Socket 10		

PROGRAM INDICATION 8002288, PC 5

R1	5001033	1.8 kohms 10% 1/2W	IL1 - IL10	8230046	12V 1W
R2	5001004	22 ohms 10% 1/2W			
R3	5001006	33 ohms 10% 1/2W			
				2510117	Clamp for IL
				7210053	Socket 6
				7210096	Socket 8

VOLUME INDICATOR 8002289, PC 6

R1	5001026	680 ohms 10% 1/2W	IL1	8230046	12V 1W
			IL2	8230046	12V 1W
				2510117	Clamp for IL

TONE/BALANCE INDICATOR 8002287, PC 7

R1	5001010	680 ohms 10% 1/2W	IL1	8230046	12V 1W
R2	5001010	680 ohms 10% 1/2W	IL2	8230046	12V 1W
R3	5001010	680 ohms 10% 1/2W	IL3	8230046	12V 1W
				2510117	Clamp for IL

MAINS-VOLTAGE SWITCH 8002291, PC 8

C1	4200109	470 µ 6V	7400119	Mains-voltage switch
RL1	7600032	14.5V		
F1	6600022	1,6A-T/250 IEC 127	0593070	Solder lug
F2	6600022	1.6A-T/250 IEC 127	7500014	Socket for pin
	7500002	Fuseholder	7500013	Contact pin

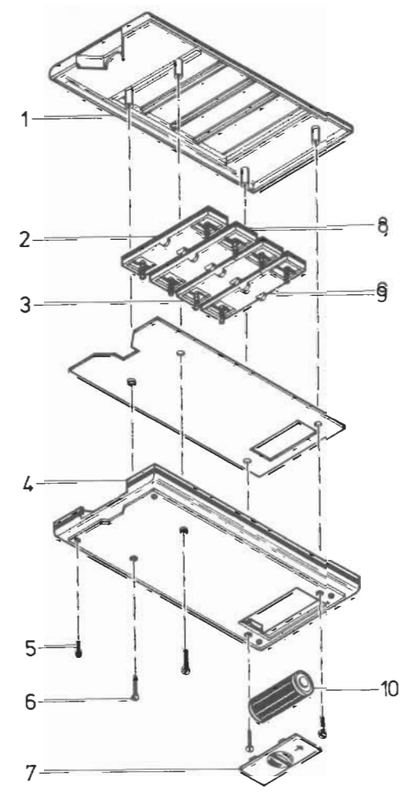
CONTROLE MODULE, 8002303, PC 9

R1	5010069	3.9 kohms 5% 1/8W	R9	5010054	1 Mohms 5% 1/8W
R2	5020034	18.7 kohms 1% 1/8W	R10	5010052	6.8 kohms 5% 1/8W
R3	5020083	33.2 kohms 1% 1/8W	R11	5010247	1.5 kohms 5% 1/8W
R4	5020099	86.6 kohms 1% 1/8W	R12	5370049	1 Mohms 20% LIN.
R5	5020097	60.4 kohms 1% 1/8W	R13	5010506	10 ohms 5% 1/8W
R8	5010065	100 ohms 5% 1/8W	R14	5010638	10 Mohms 10% 1/8W
C1	4110026	100 nF 2.5% 63V	C12	4340002	2 - 22 pF Foil
C2	4130109	10 nF 10% 250V	C13	4100039	200 pF 2.5%
C3	4010008	1 nF –20 +50% 400V	C14	4340002	2 - 22 pF Foil 630V
C4	4010008	1 nF –20 +50% 400V	C15	4100047	510 pF 1% 630V
C6	4010063	4.7 nF 10% 63V	C16	4200353	22 µF 40V
C7	4010027	1 nF 10% 100V	C17	4200362	4.7 µF 16V
C8	4100099	440 pF 1% 630V	C18	4011005	2.2 nF –20 +50% 400V
C9	4100046	91 pF 2.5% 630V	C19	4100051	160 pF 2.5% 630V
C10	4340002	2 - 22 pF Foil	C20	4100050	68 pF 2.5% 630V
C11	4100040	330 pF 2,5% 630V			

L1	8022078	Osc.

CM1	8470002	Microphone
	7210044	Socket 3 pol.
	2816132	Battery spring

PARTS LIST CONTROLE MODULE 8052087



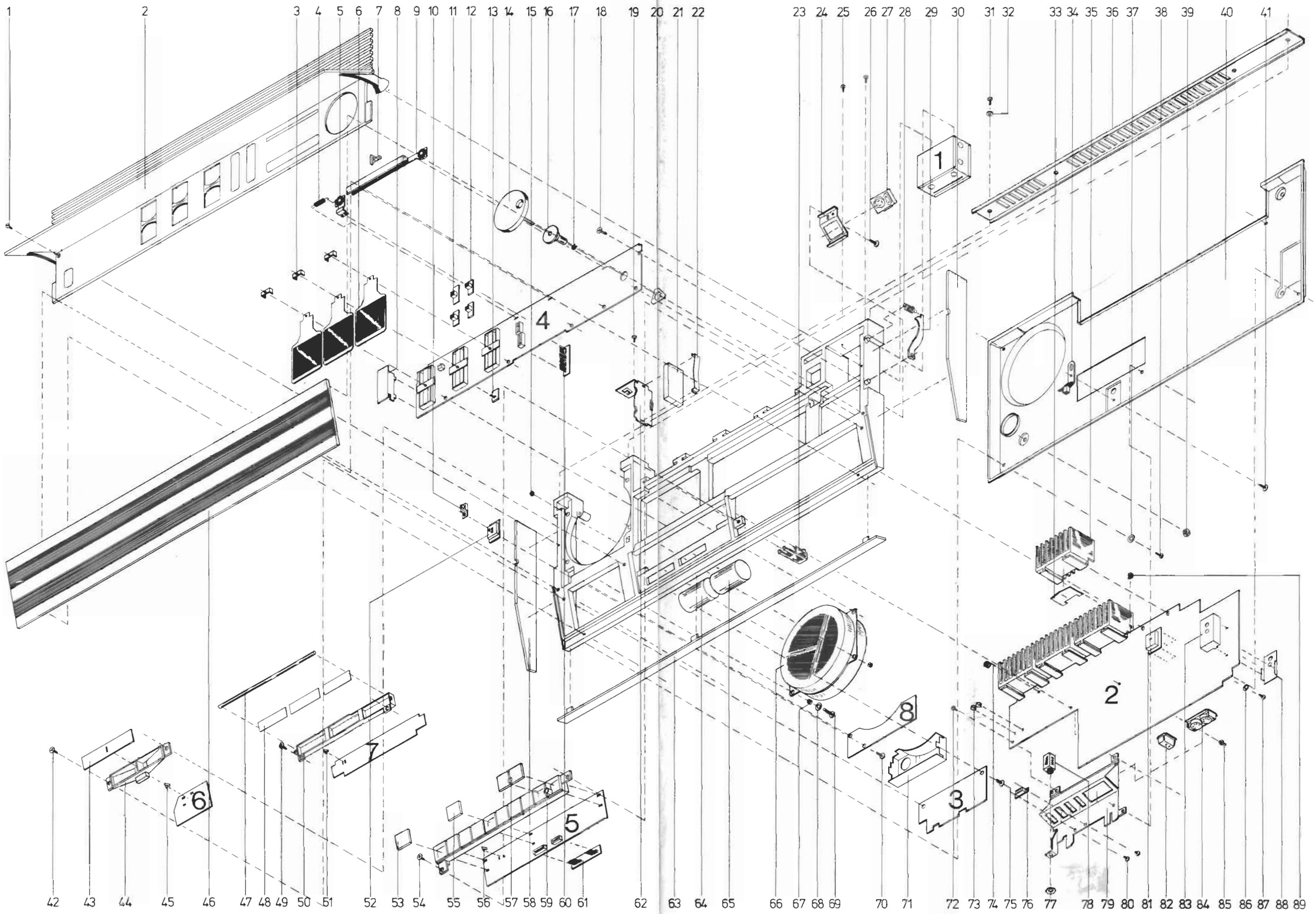
1	3164245	Cover
2	2775537	Button, VOLUME
3	2775538	Button, P3 – P4
4	3164295	Cover
5	3010007	Plastic foot
6	2013009	Screw 2.9 x 16 DIN 7982, black
7	3164150	Cover
8	2775539	Button, P1 – P2
9	2775540	Button, PHONO – OFF
10	8700066	Battery TR149 – 13V
	2818041	Spring for button
	7500116	Contact spring for button

PARTS LIST

1	2039901	Screw AM 3 x 8 DIN 7985, black
2	3458188	Upper part with cover
3	2816122	Bronze spring
4	2810074	Spring
5	2548118	Bracket
6	3370105	Indicator mask
7	3190061	Pointer
8	3302256	Screen
9	2548119	Bracket
10	2775349	Knob, ON – OFF
11	2775351	Knob, PRE-SET VOL.
12	2775350	Knob, STEREO/LOUDN./ AFC
13	7220105	Plug, 3 pins
14	2794061	Wheel
15	2380016	Nut M 4
16	2905066	Bearing
17	2390004	Locking ring UG3 x 0.6
18	2015910	Screw 3.5 x 9.52
19	2039901	Screw AM 3 x 8 DIN 7985, black
20	2395035	Lock disc
21	8300275	Rectifier
22	2816151	Bronze spring
23	3152188	Attachment for mains lead
24	2548114	Bracket
25	2039901	Screw AM 3 x 8 DIN 7985, black
26	2015910	Screw 3.5 x 9.52
27	7210089	Socket 240/60 ohms
28	2810075	Spring
29	3011006	Friction arm
30	3412211	Cabinet, teak, 3 parts
	3412213	Cabinet, rosewood, 3 parts
	3412214	Cabinet, oak, 3 parts
	3412215	Cabinet, white, 3 parts
31	2039901	Screw AM 3 x 8 DIN 7985, black
32	2622252	Washer 3.2
33	2816120	Spring
34	2854046	Arm
35	2568220	Heat sink
	2013024	Screw 2.9 x 6.5, black
	2622261	Washer
36	3452307	Back plate
37	2622041	Washer 3.2
38	2039901	Screw AM 3 x 8 DIN 7985, black
39	3035026	Plastic foot
40	3454211	Bottom plate
41	2013076	Screw 2.84 x 4.16, black
42	2015910	Screw 3.5 x 9.52
43	3370092	Window, red
44	3131105	Housing
45	2510117	Clamp
46	3168084	Front panel
	2816148	Contact spring
	2039011	Screw AM 3 x 25 DIN 7985, black
	2039909	Screw AM 3 x 28 DIN 7985
47	3370097	Magnifying rod
48	3370093	Window, red
49	2015910	Screw 3.5 x 9.52
50	3131106	Housing
51	2510117	Clamp
52	7450023	Mains switch
53	3370094	Window, green
54	2015910	Screw 3.5 x 9.52
55	3370095	Window, red
56	2510117	Clamp
57	3370096	Windows, 2 parts, green
58	3412211	Cabinet, teak, 3 parts
	3412213	Cabinet, rosewood, 3 parts
	3412214	Cabinet, oak, 3 parts
	3412215	Cabinet, white, 3 parts
59	3131107	Housing
60	7220106	Plug, 18 pins
61	7220110	Plug, 14 pins
62	2542460	Bracket
63	3412211	Cabinet, teak, 3 parts
	3412213	Cabinet, rosewood, 3 parts
	3412214	Cabinet, oak, 3 parts
	3412215	Cabinet, white, 3 parts
64	4200305	5000 µF 35 V
65	4200305	5000 µF 35 V
66	8013145	Mains transformer
67	2938125	Rubber bushing
68	2622024	Washer 4.3
69	2043900	Screw AM 4 x 20 DIN 7985
70	2015907	Screw 3.5 x 12.7
71	3172068	Cover
72	2013076	Screw 2.89 x 4.16
73	7500002	Fuse holder
74	3358113	Cooling coil
75	2015910	Screw 3.5 x 9.52
76	7400102	Speaker switch
77	2380043	Nut
78	7210023	Jack-socket
79	2548113	Chassis
80	2034231	Screw AM 2 x 4 DIN 84
81	8002293	PC-board, volume control
82	7211047	Socket 2 pol.
83	3304052	Screen, housing
84	7210088	Socket 2 x 5 pol.
85	2992059	Pin
86	2622052	Fibre washer
87	2013202	Screw 2.9 x 9.52 DIN 7981
88	3302248	Screen
89	2992042	Spacer

PARTS NOT SHOWN

3152228	Bag with accessories
3391467	Outer carton
3391468	Top/bottom insert
3397249	Foam packing, left
3397250	Foam packing, right
3532120	Diagram
2622248	Mica sheet for 2TR27
2625002	Tooth-lock washer 3.2
2816148	Contact spring, sensitouch
6271048	Mains lead with euro-plug
7500014	Contact bushing
7500013	Contact spear
3170041	Insulating bead for 2R98 and 2R99
3984005	Lubricant for friction arms ROCOL KILOPOISE 0868
3172074	Insulating disc for TO–66


1
2
3
4
5
6
7
8
1
2
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41
42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89

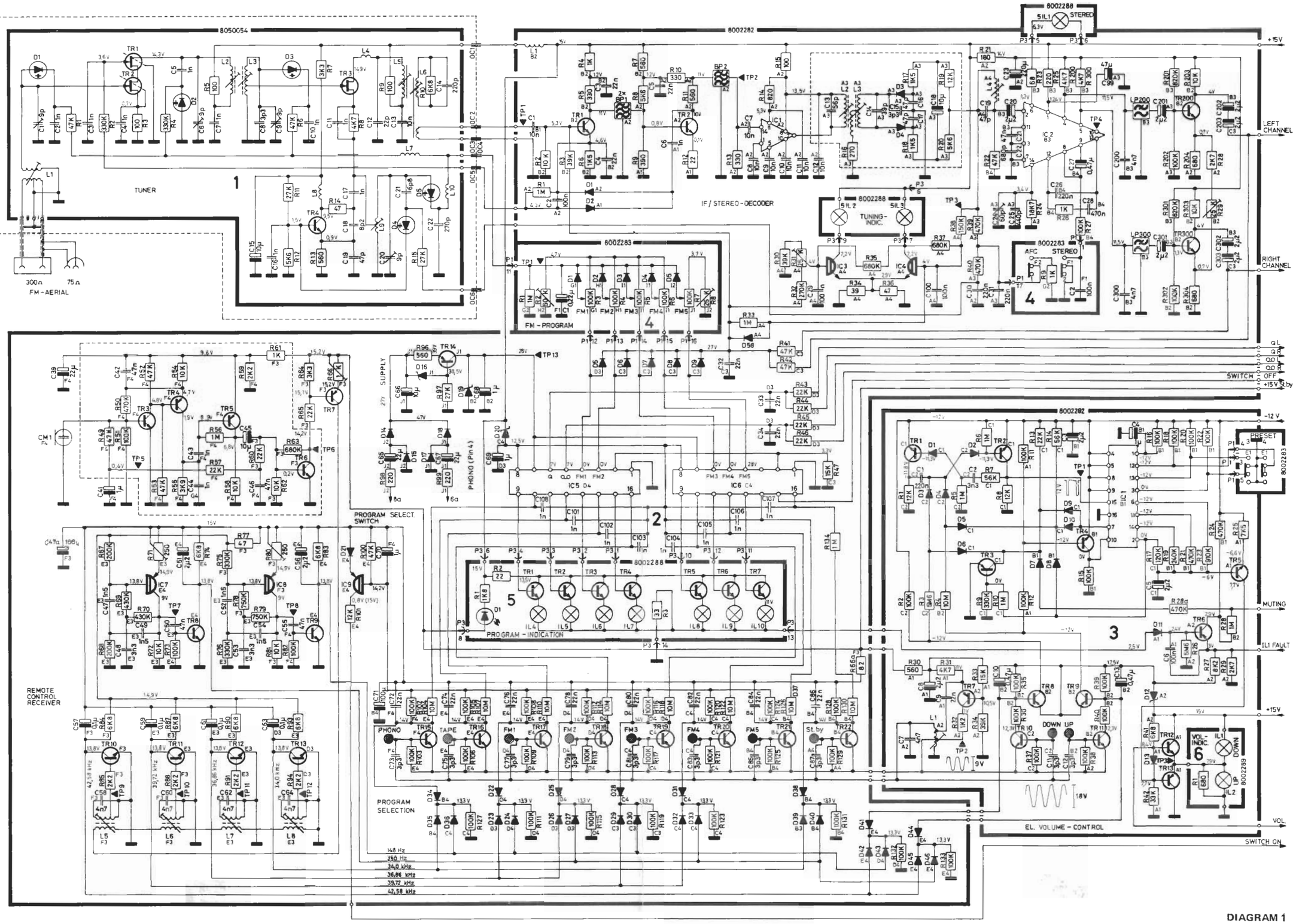

8050054
TUNER
FM-AERIAL
300Ω
75Ω
8002282
IF/STEREO-DECODER
8002283
FM-PROGRAM
8002288
STEREO
TUNING-INDIC.
8002283
AFC STEREO
+15V
LEFT CHANNEL
RIGHT CHANNEL
SWITCH
-12 V
MUTING
IL1 FAULT
SUPPLY
PHONO (Pin 4)
PROGRAM SELECT. SWITCH
PROGRAM SELECTION
PROGRAM - INDICATION
REMOTE CONTROL RECEIVER
EL. VOLUME - CONTROL
VOL
SWITCH ON
148 Hz
250 Hz
34,0 kHz
36,86 kHz
39,72 kHz
42,58 kHz

DIAGRAM 1

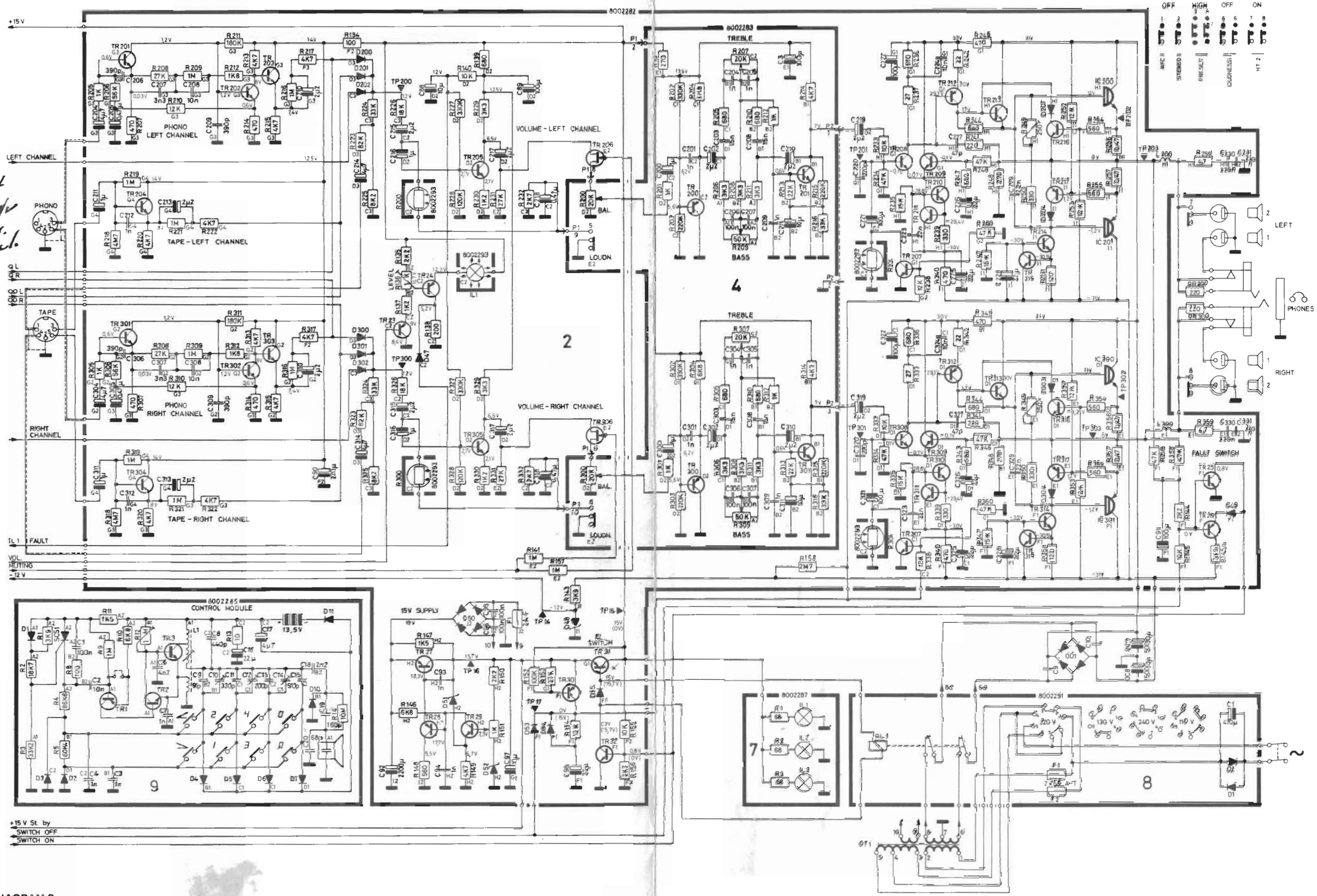
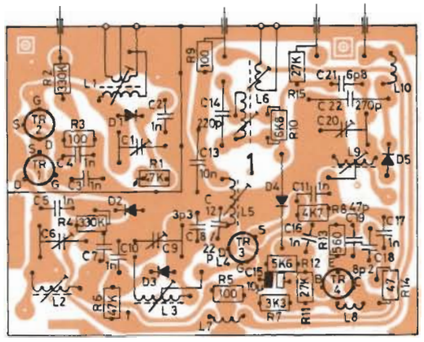
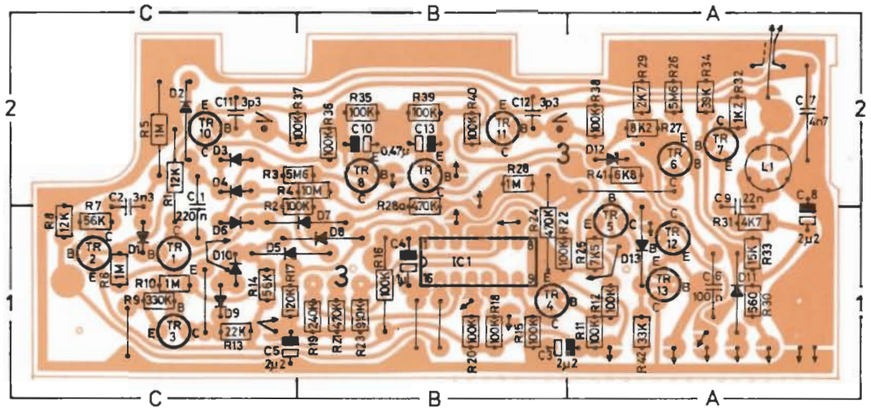
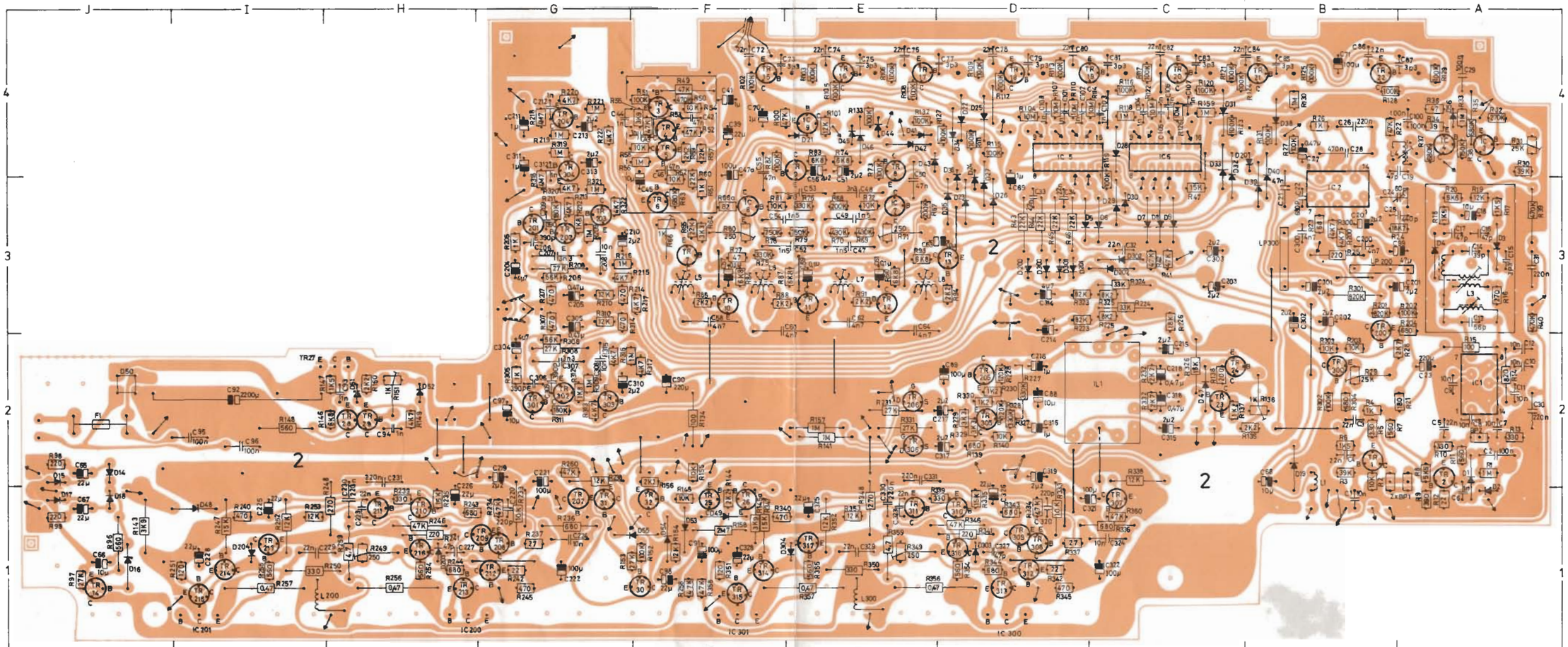
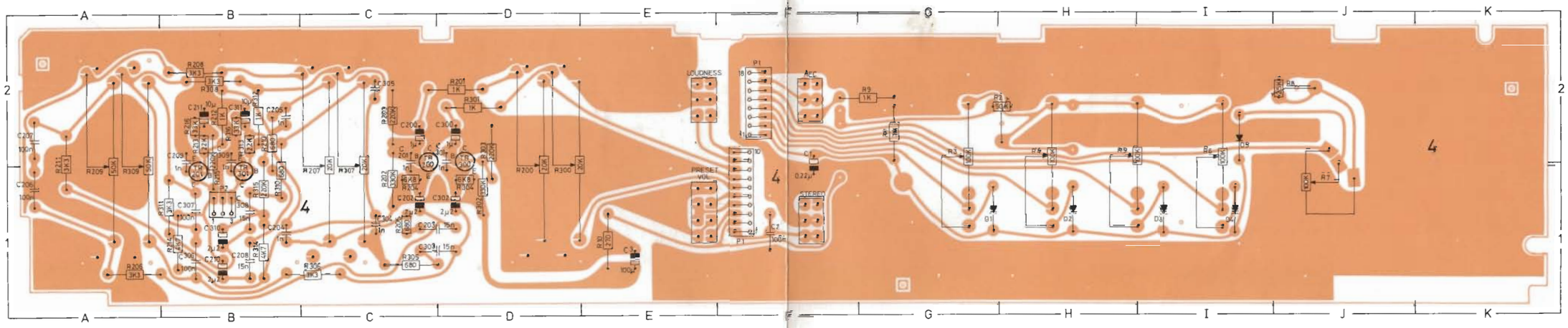

8002282
8002283
8002285
8002287
8002291
+15 V
LEFT CHANNEL
RIGHT CHANNEL
PHONO
TAPE
PHONO LEFT CHANNEL
TAPE - LEFT CHANNEL
PHONO RIGHT CHANNEL
TAPE - RIGHT CHANNEL
VOLUME - LEFT CHANNEL
VOLUME - RIGHT CHANNEL
TREBLE
BASS
BAL.
LOUDN.
CONTROL MODULE
15V SUPPLY
FAULT
MUTING
+12 V
+15 V St. by
SWITCH OFF
SWITCH ON
OFF
HIGH
OFF
ON
MFC II
STEREO II
PRESELECT
LOUDNESS
HT 2
LEFT
RIGHT
PHONES
FAULT SWITCH
220 V
130 V
240 V
110 V

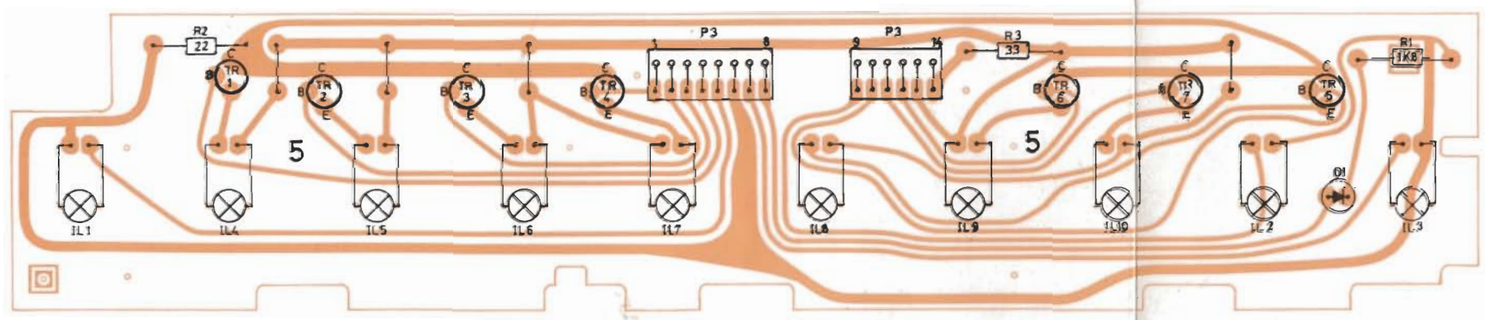
DIAGRAM 2

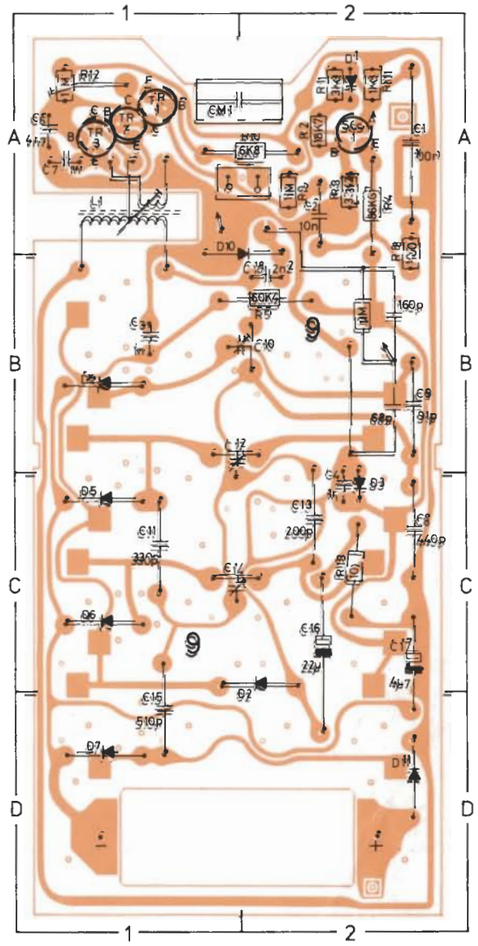


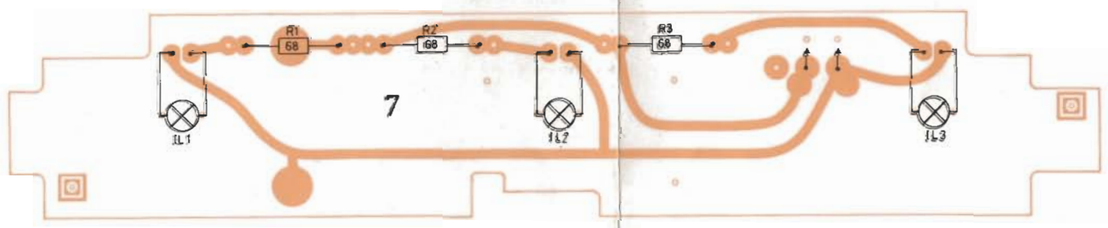


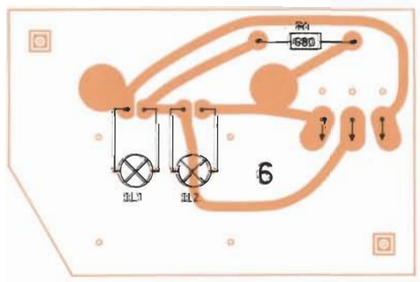


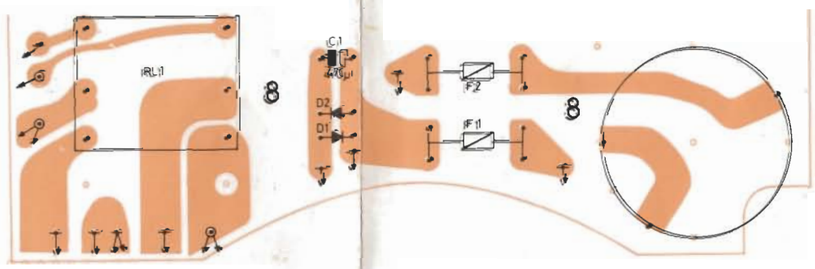

A
B
C
D
E
F
G
H
I
J
K
1
2
4
LOUDNESS
PRESET VOL
STEREO
P1
R9 1K
C1 0.22µ
C7 10n
R1 10K
R2 10K
R3 10K
R6 10K
R7 10K
R8 10K
R9 10K
G1
G2
G3
G4
D1
D2
D3
D4

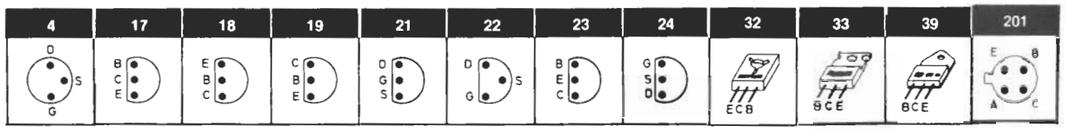

5
R2 22
P3
P3
R3 33
R1 1K8
TR 1
TR 2
TR 3
TR 4
TR 5
TR 6
TR 7
IL1
IL4
IL5
IL6
IL7
IL8
IL9
IL10
IL2
IL3
D1


1
2
A
B
C
D
9
L1
L2
CM1
R11 1K
R12 1K
R13 6K8
R14 1K
R15 150K
R16 150K
R17 1K
R18 1K
R19 1K
R20 1K
R21 1K
R22 1K
C1 100p
C2 10n
C3 160p
C4 68p
C5 91p
C6 200p
C7 330p
C8 440p
C9 22µ
C10 4µ7
C11 510p
C12 10n
C13 2n2
C14 150K
C15 150K
C16 1K
C17 1K
C18 1K
C19 1K
C20 1K
C21 1K
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10


7
R1 68
R2 68
R3 68
IL1
IL2
IL3


6
R1 680
IL1
IL2


8
IRL1
C1
F1
F2
D1
D2



TRANSISTOR AND IC LIST

1TR1	8320119	4	U 1981 E
1TR2		21	2N 5245
		21	TIS 88 A
		21	SPF 2038
1TR3	8320136	4	U 1981 E
		21	3 C 2
		21	TIS 88
		21	SPF 2060
1TR4	8320112	23	BF 255
		23	BF 495
2TR1	8320311	23	BF 240
2TR2			
2TR3	8320095	18	BC 549 B
		18	BC 184 BN
2TR4	8320069	18	BC 559 B
		18	BC 214 B
		17	BC 214 BL
2TR5	8320104	18	BC 558 B
		18	BC 213 B
		17	BC 213 BL
		18	BC 308 B
		18	BC 252 B
2TR6	8320132	18	BC 548 B
		18	BC 183 B
		17	BC 183 BL
2TR7	8320161	18	BC 212 B
		17	BC 212 BL
		18	BC 251 B
2TR8 --	8320132	18	BC 548 B
2TR13		18	BC 183 B
		17	BC 183 BL
2TR14	8320316	18	BC 327
2TR15 --	8320132	18	BC 548 B
2TR22		18	BC 183 B
		17	BC 183 BL
2TR23	8320104	18	BC 558 B
		18	BC 213 B
		17	BC 213 BL
		18	BC 308 B
		18	BC 252 B
2TR24	8320316	18	BC 327 B
2TR25	8320132	18	BC 548 B
		18	BC 183 B
		17	BC 183 BL
2TR26	8320161	18	BC 212 B
		17	BC 212 BL
		18	BC 251 B
2TR27	8320257	33	TIP 32A
2TR28	8320316	18	BC 327
2TR29	8320132	18	BC 548 B
		18	BC 183 B
		17	BC 183 BL
2TR30	8320104	18	BC 558 B
		18	BC 213 B
		17	BC 213 BL
		18	BC 308 B
		18	BC 252 B
2TR31	8320240	32	BD 136
		32	BD 136 W
2TR32	8320132	18	BC 548 B
		18	BC 183 B
		17	BC 183 BL
2TR200/300	8320095	18	BC 549 B
2TR201/301		18	BC 184 BN
2TR202/302			
2TR203/303	8320132	18	BC 548 B
		18	BC 183 B
		17	BC 183 BL
2TR204/304	8320221	18	BC 549 C
2TR205/305			
2TR206/306	8320345	24	MPF 111
2TR207/307	8320132	18	BC 548 B
		18	BC 183 B
		17	BC 183 BL
2TR208/308	8320377	18	BC 547 C
2TR209/309		18	BC 182 C
		17	BC 182 CL
2TR210/310	8320092	18	BC 182 B
		17	BC 182 BL
		18	BC 547 B
2TR211/311	8320132	18	BC 548 B
		18	BC 183 B
		17	BC 183 BL
2TR212/312	8320365	19	MPS H54
2TR213/313	8320321	19	MPS A06
2TR214/314			
2TR215/315	8320132	18	BC 548 B
2TR216/316		18	BC 183 B
		17	BC 183 BL
2TR217/317	8320104	18	BC 558 B
		18	BC 213 B
		17	BC 213 BL
		18	BC 308 B
		18	BC 252 B
2IC1	8340071		MC 1355 PQ
2IC2	8340032		MC 1310 PQ
			CA 1310 QE
			MC 1310 N
2IC3	8340028	19	MPS A13
2IC4		19	SPS 5418
		19	TPS A13
2IC5	8340055		SAS 570 S
2IC6			
2IC7	8340025	18	BC 516
2IC8		19	MPS A65
2IC9		19	SPS 5431
2IC200/300	8340042	39	TIP 141
2IC201/301	8340041	39	TIP 146
3TR1	8320132	18	BC 548 B
3TR2		18	BC 183 B
		17	BC 183 BL
3TR3	8320104	18	BC 558 B
		18	BC 213 B
		17	BC 213 BL
		18	BC 308 B
		18	BC 252 B
3TR4	8320132	18	BC 548 B
		18	BC 183 B
		17	BC 183 BL
3TR5	8320377	18	BC 547 C
		18	BC 182 C
		17	BC 182 CL
3TR6	8320104	18	BC 558 B
3TR7		18	BC 213 B
		17	BC 213 BL
		18	BC 308 B
		18	BC 252 B
3TR8	8320161	18	BC 212 B
3TR9		17	BC 212 BL
		18	BC 251 B
3TR10	8320132	18	BC 548 B
3TR11		18	BC 183 B
		17	BC 183 BL
3TR12	8320221	18	BC 549 C
3TR13	8320104	18	BC 558 B
		18	BC 213 B
		17	BC 213 BL
		18	BC 308 B
		18	BC 252 B
3IC1	8340070		MP 14515 CP
4TR200/300	8320069	18	BC 559 B
		18	BC 214 B
		17	BC 214 BL
4TR201/301	8320095	18	BC 549 B
		18	BC 184 BN
9TR1 --	8320109	18	BC 548 B
9TR7		18	BC 183 B
		17	BC 183 BL
		18	BC 239 B
		18	BC 172 B
9TR1	8320104	18	BC 558 B
		18	BC 213 B
		17	BC 213 BL
		18	BC 308 B
		18	BC 252 B
9TR2	8320109	18	BC 548 B
		18	BC 183 B
		17	BC 183 BL
		18	BC 239 B
		18	BC 172 B
9TR3	8320097	18	BC 547 B
		18	BC 182 B
		17	BC 182 BL
		18	BC 237 B
		18	BC 171 B
9SCS1	8300219	201	BR 101

DIODE LIST

0D1	8310275	B 80 C 5000
1D1	8300050	BB 103 blue
1D2-1D3	8300041	BB 103 green
1D4	8300032	BA 138
1D5	8300050	BB 103 blue
2D1-2D2	8300131	1N 4148
2D3-2D4	8300142	AA 143
		OA 47
2D5-2D9	8300131	1N 4148
2D14-2D15	8300023	1N 4002
		1N 4003
2D16	8300128	ZPD 5.6 V 5 %
		BZX 79 5.6 V
2D17-2D18	8300023	1N 4002
		1N 4003
2D19	8340105	ZTK 27 ass.
2D20	8300222	ZPD 2.7 V 5 %
		BZX 83 2.7 V
2D21-2D47	8300131	1N 4148
2D48	8300029	ZPD 12 V 5 %
		BZX 79 12 V
2D49	8300131	1N 4148
2D50	8300277	50 V 2 A
2D51	8300028	ZPD 9.1 V 5 %
		BZX 79 9.1 V
2D52	8300128	ZPD 5.6 V 5 %
		BZX 79 5.6 V
2D53-2D54	8300131	1N 4148
2D55	8300023	1N 4002
		1N 4003
2D56	8300131	1N 4148
2D200/300 - 2D204/304		
3D1-3D11	8300131	1N 4148
3D12	8300222	ZPD 2.7 V 5 %
		BZX 83 2.7 V
3D13	8300131	1N 4148
4D1-4D5	8300131	1N 4148
5D1	8300195	TIL 209A
		LED 5075B
8D1-8D2	8300023	1N 4003
		1N 4002
9D1	8300058	1N 4148
		SFD 184
9D2	8300131	1N 4148
9D3	8300058	1N 4148
		SFD 184
9D4-9D10	8300102	1N 4004
9D11	8300131	1N 4148

MÅLEBETINGELSER FOR DIAGRAM:

Alle DC spændinger er målt i forhold til stel med voltmeter (indre modstand 11 MOhm).
DC spændinger *uden* parentes er målt med modtageren i stilling FM 5 og antennesignal på 500 μV (1 mV EMK) med pilottone.
VOLUME i stilling MEDIUM og højttalere *ikke* tilsluttet.
DC spændinger *i* parentes på 2IC9 er målt, når et af betjeningsfelterne aktiveres.
DC spændinger *i* parentes på 2TR30, 2TR31 og 2TR32 er målt i stilling STAND BY.
FM signalniveauer er målt ved Δ f 40 kHz, f mod. 1 kHz og antennesignal på 500 μV (1 mV EMK).
LF følsomheder er målt ved 30 W output. Balance, bas, diskant på 0, volume på max. Udgang belastet med 4 Ohm, input 1 kHz.

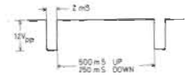
CONDITIONS FOR MEASUREMENT FOR DIAGRAM:

All DC voltages are measured in proportion to chassis with voltmeter (inner resistance 11 MOhm).
DC voltages *without* bracket are measured with the receiver in position FM 5 and aerial signal 500 μV (1 mV EMK) with pilot signal.
Volume in position MEDIUM and speakers *not* connected.
DC voltages *with* brackets on 2IC9 are measured when one of the operating fields is activated.
DC voltages *with* brackets on 2TR30, 2TR31 and 2TR32 are measured in position STAND BY.
FM signal levels are measured at Δf 40 kHz, f mod. 1 kHz and aerial signal 500 μV (1 mV EMK).
LF sensitivities are measured at 30 W output. Balance, bass treble on 0, volume on max.
Output loaded with 4 Ohm, input 1 kHz.

MESSBEDINGUNGEN FÜR SCHALTBILD:

Alle DC Spannungen sind im Verhältnis zu Chassis mit Voltmeter (innerer Widerstand 11 MOhm) gemessen.
DC Spannungen *ohne* Klammern sind mit dem Empfänger in Stellung FM 5 und Antennensignal von 500 μV (1 mV EMK) mit Pilotton gemessen.
Volume in Position MEDIUM und Lautsprecher *nicht* angeschlossen.
DC Spannungen *in* Klammern auf 2IC9 sind gemessen, wenn eines der Bedienungsfelder aktiviert sind.
DC Spannungen *in* Klammern auf 2TR30, 2TR31 und 2TR32 sind in Position STAND BY gemessen.
FM Signalniveaus sind bei Δf 40 kHz, f mod. 1 kHz und Antennensignal von 500 μV (1 mV EMK) gemessen.
LF Empfindlichkeit sind bei 30 W output gemessen. Balance, Tiefton, Diskant auf 0, Volume auf max. Ausgang mit 4 Ohm belastet, Eingang 1 kHz.

TESTPOINTS

2TP2	IF signal	2TP17	15 V in STAND BY, 0 V on program
2TP3	FM detector adjustment		
2TP4	Osc. adjustment (2C24) 3 V_{pp} square-wave 19 kHz	2TP202	12 mV
		2TP302	12 mV
2TP7	Mod. freq. adj. 250 Hz	2TP203	0 V ± 200 mV
2TP8	Mod. freq. adj. 148 Hz	2TP303	0 V ± 200 mV
2TP9	Carrier freq. adj. 42.58 kHz		
2TP10	Carrier freq. adj. 39.72 kHz	3TP1	
2TP11	Carrier freq. adj. 36.86 kHz		
2TP12	Carrier freq. adj. 34.00 kHz		
2TP13	27 V ± 1.5 V	3TP2	3.2 V eff. (RMS), 9 V_{pp} approx. 100 kHz
2TP14	−11.5 V ± 1.5 V	3TP3	7.9 V, volume in MEDIUM
2TP15	15 V ± 0.1 V	4TP1	Tuning voltage
2TP16	15.5 V ± 0.3 V		

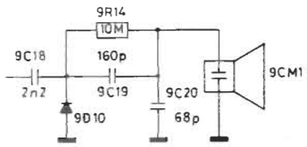
FM SIGNAL LEVELS

2TP1	9 mV	2TP3	180 mV, 1 kHz
2TP2	100 mV		

SENSITIVITIES

2TP200	150 mV	2TP301	160 mV
2TP300	150 mV	PHONO	3 mV
2TP201	160 mV	TAPE	220 mV

MODIFICATIONS



Our life test has shown that 9CM1 changes capacity after a short time of use. This causes a change of the four carrier frequencies and the control module will not function correctly. To avoid this a link consisting of 9C19, 9C20 and 9R14 has been introduced which reduces 9CM1's influence on the resonance frequency.

The influence from 9CM1 is now reduced 3 – 4 times.
9R14 is mounted to maintain the bias voltage to 9CM1.